Effects of a Classroom-Based Pre-Literacy Intervention for Preschoolers with Communication Disorders

EFFECTS OF A CLASSROOM-BASED PRE-LITERACY INTERVENTION FOR PRESCHOOLERS WITH COMMUNICATION DISORDERS

A Dissertation Presented

by

ALYSSA R. CURRIER

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
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Communication Disorders

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DEDICATION

In loving memory of my mother, whose compassion for others inspired me to pursue work to improve the education and well-being of children.

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ABSTRACT

EFFECTS OF A CLASSROOM-BASED PRE-LITERACY INTERVENTION FOR PRESCHOOLERS WITH COMMUNICATION DISORDERS

MAY 2013

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Children with communication disorders are often at risk of literacy difficulties, especially students that present with autism and/or speech sound disorders. This quasi-experimental study is designed to examine the effects of a 10-week "hybrid" intervention for preschool students with and without communication disorders in an integrated classroom. The classroom intervention targets both vocabulary and phonological awareness, two critical components of literacy that are strongly correlated with one another. The objectives of this study are (1) to provide empirical evidence that classroom-based pre-literacy intervention can be effective for students with communication disabilities, allowing for more time with their peers in a potentially least-restrictive environment and (2) to demonstrate that typically-developing preschool children also benefit from classroom-based pre-literacy training.

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CHAPTER 1

PHONOLOGICAL FOUNDATIONS

Introduction

The theoretical background of phonological representations and phonological processing is complex and continues to be largely debated. Understanding of such theoretical backgrounds is of utmost importance when considering the underpinnings of cognitive processes related to phonological and phonemic awareness and ultimately reading acquisition. These theories are addressed in this chapter. Both of these concepts will be examined in relation to speech sound development, phonological awareness, vocabulary, and literacy. In addition, the role of weak or poor quality phonological representations is also discussed in this chapter as they relate to communication disorders and literacy development.

Phonological Representations

The term "phonological representation" describes the long-term storage of the phonological information about a word. These representations are considered to be key cognitive structures used for producing spoken words. In addition, these representations must be adequate for phonological processing, otherwise deficits or weaknesses may result in reading difficulties (Foy & Mann, 2001). Representations must also be easily accessible for speech production and tasks that involve phonological awareness and decoding (Sutherland & Gillon, 2007).

Phonological Skills Required for Reading

There are three components that are typically considered critical for phonological processing: phonological awareness, phonetic recoding for working memory, and phonological recoding in lexical access. Phonological awareness refers to the cognitive skill that allows one to access and reflect upon sounds in one's own language (Mattingly, 1972, as cited in Gillon, 2004). Phonological awareness has been described as the single best predictor of reading performance (Liberman, Shankweiler, Liberman, 1989, as cited in Gillon 2004). More specifically*, phonemic awareness* is regarded as one of the most important skills for reading acquisition. Phonemic awareness refers to the awareness of individual segments. Specific phonemic awareness tasks that are important predictors of reading success include blending (Wagner, Torgesen, Rashotte (1994), segmenting (Share, Jorm, Maclean, & Matthews, 1984), and manipulation (Lundberg, Olofsso, & Wall, 1980).

Recoding occurs both at the working memory level and the lexical level. At the level of working memory, written symbols of a word are phonetically recoded into a sound-based representation in order to maintain the words in working memory, blend the sounds, and form a word. Phonological recoding then happens at the lexical level to access meaning (Baron & Strawson, 1976; Liberman & Mann, 1981; Martin, 1978).

Phonological Memory

Several studies have examined phonological memory in children with poor phonological awareness (Gathercole, 1995; Oakhill & Kyle, 2000). Phonological memory is a necessary skill for the processing of phonological information, and

ultimately reading. Studies that have examined phonological memory often use nonword repetition as a measure. This task requires a child to rely heavily on his/her phonological memory system in order to encode the information, maintain a sequence of sounds, and repeat the word accurately. In order to do this, the distinctness or strength of the underlying phonological representation must be adequate (Edwards & Lahey, 1998; Gathercole, Willis, Baddeley, & Emslie, 1994).

Vocabulary

As mentioned above, one critical component of phonological processing is phonological recoding in lexical access. Written symbols are recoded into phonological representations that then allow access to the lexical representation. Although the relationship between vocabulary and phonological representations is hotly debated (e.g., Elbro, Nielson, & Petersen, 1994, as cited in Wesseling; Walley, 2003; Vihman, 2011), it is evident that vocabulary plays a critical role in reading, as a child is required to access semantic information when decoding (Gillon, 2004).

The theory of lexical restructuring (Walley, 1998) provides one explanation for this relationship. Proponents for this theory accept the idea that lexical representations are initially more wholistic and that they are "forced" to become segmental as vocabulary increases. This forced segmental storage would then allow a child to become more phonemically aware. There are contradictions and variability in the literature that prevent complete acceptance of this theory. Vihman (2011) assumes that phonological representations are dynamic and that children depend on them for word learning. Regardless of the issues of changes in representations, researchers generally do accept the idea that vocabulary provides a

foundation for phonological awareness (Walley, Metsala, & Garlock, 2003; Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003).

Relationship between phonemic awareness, phonological memory, and vocabulary

Phonological representations are likely to be one underlying common denominator for all three weaknesses observed in children with poor phonological awareness. It can also be argued that the three characteristics influence each other. Foy and Mann (2001) specify that phoneme awareness is differentially associated with vocabulary. Furthermore, they found that phoneme awareness is mediated by vocabulary, age, and letter knowledge. Silven, Niemi, Voeten (2002) found that vocabulary size in young children can influence phonological awareness (though not necessarily phonemic awareness as this was not examined). Their research suggests that those children who were fast-mapping word meanings during infancy could later reflect upon sound patterns more accurately three years later. This supports the idea that early vocabulary knowledge can contribute to language acquisition and ultimately phonological awareness.

Phonological memory is also linked to vocabulary. Performance scores on PM were closely related to scores of vocabulary knowledge in several studies (Gathercole & Baddeley, 1989; Gatherco1e, Willis, Emslie, & Baddeley, 1992). Many researchers view the relationship of PM with vocabulary as a reciprocal one. Phonological memory has been found to influence the learning of new words in young children (Gathercole & Baddeley, 1990). Phonological memory also appears to play a major role in vocabulary development between the age of 4 and 5;

however, as a child matures, vocabulary seems to play the bigger role in development (Gathercole, Willis, Emslie, & Baddeley, 1992).

Communication Disorders and Reading Development

Children with communication disorders may be at risk for reading disorders due to poor phonemic awareness. Between 30% and 77% of children with speech sound disorders struggle with reading. This risk increases with severity and persistence of the speech sound disorder, deviant articulation patterns, and comorbid language disorders. It is also reported that half of all children with language disorders experience reading problems in the early school years (Anthony, Aghara, Dunkelberger, Anthony, Williams, Zhang, 2011).

There are several theories as to why some children fail to develop typical phonemic awareness. Empirical evidence from several decades of research supports the notion that babies learn phonology through implicit learning. That is, a child incidentally learns the probabilities of linguistic features in the language to which they are exposed. Research suggests that children can learn word segmentation in a continuous speech stream. Transitional probabilities from one sound to the next provide cues to word boundaries (Velleman & Vihman, 2002; Saffron, Aslin, Newport, 1996; Saffron, Newport, Aslin, Tunick, Barreuco, 1997). Over time, children become more systematic in acquiring a specific language. It is hypothesized that children learn phonological representations of phonemes so that their phonological system becomes more orderly (Menn & Vihman, 2011). Some theorists suggest that poor phonological awareness (including phonemic awareness) observed in children with dyslexia may be due to a deficit in implicit

learning; however, Roodenrys & Dunn (2007) did not find this to be true. Using a cued reaction time task, they found that children with dyslexia showed an overall slower response time, but they acquired implicit knowledge at the same rate as typical readers.

Poor phonemic awareness may be related to the "quality" or "distinctness" of children's phonological representations. "Distinctness theory" (Elbro, Nielson, & Peterson, 1994, as cited in Wesseling & Reitsma, 2001) suggests that phonological information is "packed" into mental representations of vocabulary words to make them more distinct and efficient for processing. Those with less distinct or poor quality representations have difficulty articulating words and consciously reflecting upon them. This would then affect tasks that require one to think about or manipulate segmental components of a word (Elbro, 1996).

Earlier studies indicate that children with dyslexia showed differences in the quality of their phonological representations. Elbro, BorstrØm, & Petersen (1998) looked at the quality of phonological representations in children at risk by analyzing vowel sound production in multisyllabic words in children at risk of dyslexia. They found that children whose vowel productions were deviant from the expected vowel production at age 6 were more likely to demonstrate poor phonological awareness at age 8. It was concluded that deviant vowel productions indicated phonological representations of poor quality.

Other researchers suggest representations in some people may only be partially specified or otherwise deficient. These deficiencies would interfere with the process of becoming phonemically aware, which would, in turn affect grapheme-

phoneme correspondences (Carroll & Snowling, 2004; Reed, 1989; Wagner & Torgesen, 1987). Sutherland & Gillon (2005) found evidence for poor representations among children with speech impairment. They examined phonological processing abilities of children between 4-6 years of age with speech impairment and children with typical speech (but at risk of dyslexia due to a genetic relationship). They found that both groups performed poorly on phonological processing tasks include learning new words, detecting mispronounced words, repeating words, and producing speech sounds.

Deficits in phonemic awareness may also reflect poorly defined categorical perception. Manis, McBride-Chang, Seidenberg, Doi, Munson, Petersen (1997) tested phonological awareness and phoneme identification of children with dyslexia and compared them to groups of matching chronological age (CA) and reading level. Children with dyslexia showed less sharply defined categorical perception compared to peers in the CA, but not the reading level group, during a task that required them to judge a "bath-path" continuum with varying voice onset time. Results suggest that perceptual deficits may be present in some children with reading disabilities.

The problem of access to phonological representations has also been considered (Sutherland & Gillon, 2007). Children with moderate to severe speech impairment between the ages of 3 and 5 were compared to children with typical speech. Participants were asked to judge the correctness of multisyllabic word productions (a measure designed to examine underlying phonological representations). They were then asked to judge a new word in order to determine

their ability to create new phonological representations. Finally, the children were asked to repeat real words and nonwords. Children with speech impairment had more difficulty judging correct and incorrect productions of words. These results suggested that children with speech impairment may have greater difficulty storing and/or accessing phonological representations compared to children with typical speech development.

CHAPTER 2

PRE-LITERACY INTERVENTION

Signs and Symptoms of Phonological Deficits

Before discussing approaches to intervention, it is important to examine the typical symptoms of phonological awareness/literacy disorders. Deficits in the following areas are frequently listed when discussing individuals at risk of developing reading disorders:

- Vocabulary
- Articulation
- Word finding
- Rapid automatic naming (RAN)
- Rapid alternating stimulus naming (RAS)
- Rhyming
- Alphabet knowledge
- Segmental manipulation tasks (Pratt & Brady, 1988)
- Syllable tasks (counting, segmenting, blending) (Swan & Goswami, 1997)
- Phoneme identification (Swan & Goswami, 1997)

The following list reviews the possible causes for the symptoms observed in individuals who perform poorly on tasks of phonological awareness:

- Weak or poorly defined phonological representations
- Poor access to phonological representations
- Weak phonological memory
- Weakness in speech perception

A number of proposed interventions target the underlying disorder, while some others only target the symptoms or behaviors; however, most target both simultaneously. Although the outcomes of several studies outlined below demonstrate positive results, many of them do not take into consideration the theoretical underpinnings of phonological awareness in relation to reading. These issues will be addressed at the end of the section that discusses symptoms. First, a review of the some of the existing interventions is provided below.

Considerations for Underlying Causes

One example of an intervention program that targets the underlying disorder would be one that treats children with co-morbid disorders. For instance, children with poor articulation as a result of poor perception may receive instruction that targets speech perception, articulation, and phoneme awareness. Explicit instruction in speech perception would not only strengthen the underlying representations, but also improve articulation, and enhance phoneme awareness simultaneously. Rvachew, Nowark, and Cloutier (2004) administered a similar intervention for children with expressive phonological delay. They examined the effects of a perceptual treatment approach to remediate speech production and phonological awareness. Thirty-four preschool children with phonological delay were randomly assigned to an experimental group or a control group. The control group listened to computerized books in addition to speech therapy. The experimental group played a computer game based on the SAILS platform to address phonemic perception, letter recognition, letter-sound association, and onset-rime matching in addition to speech therapy. The experimental group

performed better than the control group in terms of perception and articulation; however, phonological awareness skills were not superior to the control group.

Considerations for Symptoms

There are some symptoms that are not typically targeted in intervention. For instance, there are only a few programs that ask a child to partake in RAN as part of the intervention. Likewise, interventions rarely include nonword repetition tasks. Rather, interventions do typically serve to improve phonological memory (an underlying weakness) through phonology-based games and activities. RAN and nonword repetition are considered tasks that measure skills; other activities are utilized to address related deficits. Since phonological memory refers to the coding of phonological information for temporary storage (Baddeley, 1986, as cited in Lonigan, Anthony, Phillips, Purpura, Wilson, McQueen, 2009), activities that provide practice on this process, such as syllable/phoneme deletion or manipulation tasks, may theoretically address this deficit. Intensive training on these tasks would also likely improve lexical access or the speed and accuracy with which a child can access phonological information from long-term memory (Lonigan et al., 2009).

Roth, Troia, Worthington, Dow (2002) examined the efficacy of rhyming training on eight preschoolers with speech and/or language impairments using single-subject design. Their results showed dramatic improvements on trained items (including the most difficult, rhyme production). Their findings suggest that preschool children with speech and/or language impairments can make significant gains given explicit rhyme instruction. This study, while it demonstrates positive outcomes, fails to consider the underlying deficits that influence rhyming

difficulties. It is likely that these immediate improvements in rhyme do not influence future reading outcomes, as evidenced in several studies (Nancollis, Lawrie, & Dodd, 2005). Although rhyming is considered part of phonological awareness, evidence from other previous studies suggests that rhyming is not the best choice for instruction (Anthony, Lonigan, Burgess, Driscoll, Phillips, & Cantor, 2002; Anthony & Lonigan, 2004).

Considerations for Underlying Causes, Symptoms, and Theory

In most cases, interventions target both the overt symptoms and the underlying deficits as a result of their overlapping nature. Two examples of these are provided below.

Carroll and Snowling (2004) state that children with speech impairment have phonological awareness profiles that are similar to those of children who do not have a speech sound disorder but are at risk for dyslexia. Children who present with other concomitant disorders, such as specific language impairment, may be at greater risk of developing a reading disorder than those with an isolated speech sound disorder (Bird, Bishop, Freeman, 1995; Nathan, Stackhouse, Goulandris & Snowling, 2004). It appears that despite the primary diagnosis, the resulting reading disorder is commonly explained by the phonological deficit hypothesis, which purports an underlying phonological deficit affects "(1) understanding of the sound structure of spoken language, and (2) holding phonological information in short-term memory" (Gillon, 2004, p. 63). Therefore, intervention should take into consideration both the underlying deficits (potential weaknesses in phonological representations and the ability to access these representations) and the symptoms

(limited vocabulary; difficulty identifying the initial phonemes in words, segmenting phonemes, etc.).

Gillon (2005) highlights four theoretical assumptions used to design the intervention model used in her study on preschoolers with speech impairment:

1) Words are comprised of sound units; therefore, intervention should stress the importance of phoneme awareness and letter knowledge to help facilitate later experiences with decoding and encoding print.
2) Phonemic awareness is more strongly related to long-term reading success compared to syllable or rhyme awareness. Thus, intervention should target phoneme awareness rather than rhyme or syllable awareness.
3) It is believed that only typically developing young children (3 and 4 years of age) begin to acquire phonemic awareness before formal literacy instruction. Therefore, it is critical to take into consideration the developmental progression of children with speech impairment and focus on phoneme awareness (i.e., phoneme identification in words), not mastery of complex skills.
4) Explicit instruction of letter knowledge and phoneme awareness may promote the development of both skills simultaneously.

The results of Gillon's (2005) study indicated that children with speech impairment demonstrated improvements in the area of phoneme awareness. In addition, phoneme awareness was achieved while targeting articulation. This is one

example of an intervention that addresses both the underlying causes of poor phonological awareness and the symptoms.

Another possible example of treating both an underlying disorder and the resulting symptoms is a study conducted by McNeill & Dodd (2009). In this investigation, the authors examined phonological deficits in children with CAS. They found that children with CAS have poorer PA skills than children with other speech sound disorders. They hypothesize that this may be caused by deficits in phonological assembly or the creation of phonological plans for speech output. It is suggested that these deficits "disrupt the translation of words into phonological working memory" (p. 190). Therefore, intervention that targets both verbal motor planning and phonological awareness may improve both underlying representations and speech production. This phenomenon is supported by the Cerebellar Deficit Theory (Nicolson and Fawcett, 1990) and models of dyslexia that purport reading acquisition and dyslexia are inter-related with cognitive, linguistic, fine and gross motor development and deficits in any of these areas. Moriarty & Gillon (2006) examined an integrated approach for three children between 6 and 7 years of age with CAS. Two out of the three children made significant improvements on targeted speech and phonological awareness skills in a therapy program that involved explicit phoneme awareness training (phonemes in isolation, phoneme identification, segmentation, blending, and manipulation with letter blocks).

CHAPTER 3

CURRENT STUDY

Children with communication disorders are often at risk of literacy difficulties, especially students that present with neurodevelopmental problems, such as autism, and/or speech sound disorders. The objective of this study is to examine the effectiveness of an intervention program that targets vocabulary and phonological awareness, two critical components of literacy that are strongly correlated with one another. The purpose of this study is to provide empirical evidence of the effectiveness of a classroom-based instruction program that facilitates the acquisition of reading for students with communication disabilities.

This research is largely based on a previous study by Munro, Lee, and Baker (2008). In their study, Munro et al. studied the effects of a 6-week hybrid intervention for preschoolers with specific language impairment. Sessions took place once a week at a clinic where the children were seen individually. The intervention consisted of a short picture-based storybooks that offered multiple opportunities to target phonological awareness including alliteration and rhyming. In addition, books offered semantic elaborations of the words in the storybook. After the story was read, structured games were played to further target PA skills and semantic features. Students were also given materials to take home to practice further with their parents. Pre-and post-testing showed statistically significant increases in areas including phonological awareness, vocabulary, listening comprehension, and oral narratives. They also showed gains in areas of lexical and sublexical knowledge as measured on word association and word attribute tasks.

Although this study boasts significant treatment effects, these preliminary findings are somewhat limiting when considering application. Fewer students with specific language impairment and other students at risk of reading disabilities are being covered by insurance in clinical settings. As a result, many of these students are seeking an increase in services at school. With more demands on SLPs and classroom teachers, it continues to be a challenge to provide services that address pre-literacy, at least on an individual basis. There are three major differences in the current student compared to the study by Munro et al. First, the current study takes on a similar hybrid approach, but places the intervention in an integrated preschool classroom in order to determine if such a method is effective in this setting. Second, the intervention methods are changed to create more opportunities for explicit teaching for both vocabulary and phonological awareness (e.g., "Four Corners" as described in Chapter 4). Lastly, this study includes a control group in order to determine if observed gains can be attributed to the intervention and not maturation.

Table 1: Differences Between Munro et al. and Current Study

	Munro et al.	**Current Study**
Participants	17 total	28 total
Control Group	No	Yes
Setting	Clinic	Integrated Classroom
Delivery	Individual sessions	Large & Small Groups

In addition to addressing the caseload issue of SLPs, serving children in their classroom has several benefits. Classroom-room based instruction programs enables students with special needs and communication disabilities to spend more time with their peers in a potentially least-restrictive environment. This classroom-based instruction program is consistent with those recommendations of the Common Core State Standards (CCSS) that have been adopted by all states in the country, with the exception of fives states (Virginia, Texas, Minnesota, Nebraska, and Alaska) to ensure that all students in the schools are prepared for successful entry into college and the global workforce (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). The CCSS outlines a list of reading standards for kindergarteners which includes both print concepts and phonological awareness. In particular, the skills addressed in this intervention align with the following standards:

Print Concepts: CCSS.ELA-Literacy.RF.K.1 Demonstrate understanding of the organization and basic features of print.

CCSS.ELA-Literacy.RF.K.1d Recognize and name all upper- and lowercase letters of the alphabet.

Phonological Awareness: CCSS.ELA-Literacy.RF.K.2 Demonstrate understanding of spoken words, syllables, and sounds (phonemes).

CCSS.ELA-Literacy.RF.K.2a Recognize and produce rhyming words.

CCSS.ELA-Literacy.RF.K.2b Count, pronounce, blend, and segment syllables in spoken words.

CCSS.ELA-Literacy.RF.K.2d Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in three-phoneme (consonant-vowel-consonant, or CVC) words.1 (This does not include CVCs ending with /l/, /r/, or /x/.)

Phonics and Word Recognition: CCSS.ELA-Literacy.RF.K.3 Know and apply grade-level phonics and word analysis skills in decoding words.

CCSS.ELA-Literacy.RF.K.3a Demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary sound or many of the most frequent sounds for each consonant.

(National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010)

The goal of this study is to expose preschool students with communication disorders to a variety of these concepts prior to kindergarten to foster readiness. As stated by the American Speech-Language and Hearing Association (ASHA, 2012), the role of the speech-language pathologist in schools is to not only provide direct speech-language intervention, but to prevent academic failure of those who may be at risk for potential reading and learning problems.

Research Questions and Hypotheses

1) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children in an integrated classroom?

2) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children with communication disorders (autism, speech sound disorder, specific language impairment, etc.)?

3) Are there generalized effects of a classroom-based hybrid pre-literacy instruction and intervention program on oral narrative production and listening comprehension? Note: These skills are not explicitly targeted but are integrated into the intervention as a result of the intervention format.

4) What changes can be measured in lexical-semantic knowledge and sublexical storage and access pre- versus post hybrid intervention?

The corresponding null and alternative hypotheses for each variable are below. These measures will be analyzed quantitatively:

Phonological Awareness:

H_0: There are no significant differences between pre and post scores on measures of *phonological awareness* between preschool students in Classroom A (entire intervention group) and preschool students in Classroom B (entire control group).

H_1: Students in classroom A (intervention) will perform significantly better on measures of *phonological awareness* following intervention than students in Classroom B (control group).

Expressive Vocabulary

H_0: There are no significant differences between pre and post scores on measures of *expressive vocabulary* between preschool students in Classroom A (entire intervention group) and preschool students in Classroom B (entire control group).

H_1: Students in classroom A (intervention) will perform significantly better on measures of *expressive vocabulary* following intervention than students in Classroom B (control group).

Receptive Vocabulary

H_0: There are no significant differences between pre and post scores on measures of *receptive vocabulary* between preschool students in Classroom A (entire intervention group) and preschool students in Classroom B (entire control group).

H_1: Students in classroom A (intervention) will perform significantly better on measures of *receptive vocabulary* following intervention than students in Classroom B (control group).

Listening comprehension

H_0: There are no significant differences between pre and post scores on measures of *listening comprehension* between preschool students in Classroom A (entire intervention group) and preschool students in Classroom B (entire control group).

H_1: Students in classroom A (intervention) will perform significantly better on measures of *listening comprehension* following intervention than students in Classroom B (control group).

Oral Narratives

H_0: There are no significant differences between pre and post scores on measures of *oral narratives* between preschool students in Classroom A (entire intervention group) and preschool students in Classroom B (entire control group).

H_1: Students in classroom A (intervention) will perform significantly better on measures of *oral narratives* following intervention than students in Classroom B (control group).

Lexical-semantic and Sublexical Changes

H_0: There are no significant differences between Classroom A and Classroom B on pre and post performance on measures of lexical-semantic knowledge.

H_1: Students in Classroom A will perform significantly better than those in Classroom B on measures of lexical-semantic knowledge following intervention.

H_0: There are no significant differences between Classroom A and Classroom B on pre and post performance on measures of sublexical knowledge.

H_1: Students in Classroom A will perform significantly better than students in Classroom B on post measures of sublexical knowledge.

Students with Communication Disorders

Due to the limited number of children with disorders and varying degrees of severity, the following hypotheses will be examined using a qualitative approach:

H_0: There are no significant differences between pre and post scores for children with communication disorders in Classroom A (intervention) and Classroom B (control).

H_1: Students with communication disorders in Classroom A (intervention) will perform significantly better than students with communication disorders in Classroom B (control) on measures following intervention.

H_0: There are no significant differences between pre and post scores for each individual child with a communication disorder in the intervention group.

H_1: Individual students with communication disorders who receive the intervention will perform significantly better on pre- versus post- scores.

CHAPTER 4

METHODOLOGY

Research Design

This investigation will utilize a non-equivalent group quasi-experimental design. This research design will not randomly assign participants to either experimental versus control groups, as the students are already designated to classrooms in their school. The integrity of the proposed research design is not compromised in that in comparison to other non-equivalent group designs, this research design is deemed to be considerably stronger than posttest-only nonequivalent group research designs since it allows the investigator to examine post-treatment differences. However, a major caveat of this research design is the pretest scores of the participant groups. In the event that the pretest differences are not equal, the investigator will determine what difference is considered too large. One possible method to determine if the groups are "close enough" is to apply a statistical test to determine if the difference in pretest scores between Classroom A and Classroom B is greater than one standard deviation larger than observations in the normative data. Measures for clinical assessment in this study are standardized and normed; therefore, this is a reasonable assessment for determining pretest group differences (Keppner, Kivlighan, & Wampold, 1999).

Issues of Power

Power refers to the probability that a treatment effect will be observed when – and only when – it occurs. Power is dependent on the statistical test chosen, the alpha level, the sample size, and the effect size. Effect size refers to the

strength of the relationship between variables (Keppner et al., 1999). A-priori issues for this study include effect size and sample size. According to a calculation using G*Power 3.1, a total sample size of 70 (35 in each group) is necessary to generate a large effect size given an alpha level of .05 and power level set at .95. Therefore, the effects of this study may be under-powered with only medium effect sizes possible due to using 15 participants per group. As a result of this particular issue, the investigator will interpret any statistically significant findings with caution.

Participants

Two preschool classrooms in an elementary school in a suburban town in Western Massachusetts were selected for this study. The median household income for the town in 2009 was $62,465. Ninety one percent of the population is White, 3.2% is Asian, 2.6% is Hispanic or Latino, and 1.4% is African American. Each class was taught by the same teacher; one classroom was taught in the morning and the other was taught in the afternoon. The mean age of all of the preschoolers was 4 years, 7 months. The experimental group was comprised of 13 students with 8 boys and 5 girls. Within this group, 5 students were receiving services for special needs and have Individual Educational Plans (IEP). The control group was comprised of 14 students with 8 boys and 6 girls. Five of these students were receiving services for special needs and had IEPs that addressed disorders that included autism, pragmatic language disorder, speech disorder, language delay, and speech and language disorder.

Table 2: Participant Group, Age, Sex, Race, IEP Status

Group	n	Age Range (Mean)	Sex	Race (%)	Students with IEPs
Experimental	13	4;4- 5;1 (4;9)	M= 8 F= 5	Caucasian = 12 (93%) Hispanic = 1 (7%)	5
Control	13	4;4 – 5;3 (4;11)	M = 6 F = 7	Caucasian = 11 (85%) Hispanic = 2 (15%)	5

Table 3: Participants with IEPs by Group, Age, Sex, Race, and Reason for IEPs

Group	n	Age Range (Mean)	Sex	Race (%)	Reasons for IEPs	
Experimental	5	4;3-5;0 (4;9)	M= 5	Caucasian = 4 (80%) Hispanic = 1 (20%)	Phonological Delay/Disorder	3
					Expressive Lang. Disorder	1
					Mixed Receptive/Expressive Lang. Disorder	4
					Pragmatic Disorder/Autism	2
Control	5	4;5-5;3 (4;6)	M = 4 F = 1	Caucasian = 5 (100%) Hispanic = 0 (0%)	Phonological Delay/Disorder	2
					Expressive Lang. Disorder	1
					Mixed Receptive/Expressive Lang. Disorder	2
					Pragmatic Disorder	1

Variables

Independent Variables

The independent variable for this study is the hybrid intervention. Following pre-testing, the experimental group received two days of intervention for 10 weeks. The control group received "treatment as usual," which is the typical preschool curriculum. The "treatment as usual" was monitored by observations throughout the study by the primary investigator.

Dependent Variables

The dependent variables in this study are student outcomes following the intervention. Specifically these dependent variables are: a) performance on standardized measures and b) quantitative and qualitative data from clinical tasks. Measures will assess pre-literacy skills including rhyme awareness, phoneme isolation, syllable segmentation, phoneme segmentation, and letter-sound knowledge. Non-standardized tasks will assess vocabulary knowledge, including lexical-semantic and sub-lexical knowledge.

Procedures

Standardized Measures

The *Pre-Reading Inventory of Phonological Awareness (PIPA)* was used to assess phonological awareness. This test includes six subtests including Rhyme Awareness, Syllable Segmentation, Alliteration Awareness, Sound Isolation, Sound Segmentation, and Letter-Sound Knowledge.

The *Peabody Picture Vocabulary Test (PPVT-4)* was used to measure receptive vocabulary. This test demonstrates strong reliability on both internal consistency (.94) and test-retest (.93) measures. Concurrent validity ranges from .41-.84 and predictive validity ranges from .50-.75. This test has been widely used in the literature and is strongly correlated with verbal IQ (Hodapp & Gerken, 1999). This test includes a Form A and a Form B for pre- and post-testing. Performance scores on this test can also be directly compared to those from the *EVT-2.* The *PPVT-4* is considered an appropriate tool for Response to Intervention (RTI) as defined by the U.S. Department of Education. The *PPVT-4* has been normed on over 3,500 people ranging in age from 2:6-90+ years. The normative sample matches the U.S. Census for gender, ethnicity, region, and SES. Due to the normative sample, age range, and strong psychometrics, this test is deemed appropriate for this study.

The *Expressive Vocabulary Test (EVT-2)* also demonstrates strong reliability (.94 for internal consistency) and test-retest reliability ranges from .94 to .97. Concurrent validity ranges between .51-.82. There are also two equivalent forms for pre and post testing. The test was co-normed with the *PPVT-4* using a national sample of 3,5000 individuals ranging from 2:6-90+ years of age. The normative data also matches the U.S. Census in the same sense as that of the *PPVT-4*. It also meets RTI guidelines. This test was also deemed appropriate for pre- and post-test measures for the purposes of this study.

The Sentence Structure subtest from the *Clinical Evaluation of Language-Preschool, 2nd Edition (CELF-P:2)* was used to measure listening comprehension. The Sentence Structure Subtest demonstrates strong internal consistency ranging

from .69-.83 for all ages. For ages 4-5 years (the age of participants in this study), the internal consistency ranges from .78-.83. *The CELF-P:2* has concurrent validity ranging from .62-.93. The *CELF-P:2* was normed on more than 1,500 preschool-aged children ranging from 3-6 years of age. This test meets IDEA mandates, including RTI standards. Given the normative data, age range, and the use in RTI, this measure is appropriate for this study.

Non-Standardized Assessment Tasks

The assessment tasks described below were administered to both groups. These assessment tasks were adopted from the study by Munro, Lee, and Baker (2008) on which the current study was largely based. They are neither normed nor standardized; however, these measures have been administered previously in the research literature (Cronin, 2002; Sheng et al., 2006). For the purposes of reliability for the proposed study, independent coders completed an item-by-item inter-rater reliability analysis for both the word attribute identification task and the word association task. Results of the reliability test are discussed later in this section.

The first task is a *word attribute identification task* that included 36 high-frequency nouns. 18 nouns were explicitly trained during the intervention; 18 remained untrained. The trained words served as direct measures of the intervention and the untrained words served to test generalization of the intervention. Two levels of knowledge were examined. For the first level (lexical-semantic), the student was asked to name a function, attribute, or an associative feature of the word. The next level (sublexical) measured his/her awareness of

phonological properties of words. The child received a score for trained and untrained lexical-semantic and sublexical items.

The second experimental task was a *word-association task*. Twelve high frequency words (10 nouns, 2 adjectives) were presented to the child at pre-testing. At post-testing, the students were given the same 12 words along with 4 words that were targeted directly in the intervention. The 4 new words were used to note any responses that reflected learning during the intervention. The child was given 20 seconds to name as many words as he/she could that are associated with each item. The responses were coded using a system adapted by Cronin (2002, as cited in Munro, Lee, and Baker, 2007) and Sheng, McGregor, and Marian (2006). Items were coded under the following categories: a) syntagmatic (thematic relationship/found within a sentence); b) paradigmatic (shares a taxonomic relationship with the item—synonyms, antonyms, subordinates and coordinates); c) clang (shares a rhyming or alliteration feature), d) multiword (uses multiple words in response), e) repeat, and f) not related. Two coders conducted item-by-item reliability analysis of the response categories for all responses. The coders agreed on 97.1% of the responses. Consensus agreement was reached on the remaining 2.9%.

The Edmonton Narrative Norms Instrument (ENNI) is a measure of oral narratives. There are two sets of stories with three stories in each set, with each story becoming more complex. Each set also includes a trial story. First, the child is asked to look at one picture story at a time quietly with the examiner. The purpose here is to preview the story; no discussion of the story takes occurs at this point. Next, the child is asked to go back of the beginning and tell the examiner the story.

The pictures are faced away from the examiner so that the child is instructed to do the best they can to tell the examiner what is happening. The *ENNI* is a relatively new measure, which may be the reason for its limited use in the literature. Limited sources are available for the ENNI; however, in an email correspondence with the authors, they shared that the *ENNI* demonstrates strong inter-scorer reliability (.92) and several measures of validity. These include concurrent validity for story grammar (.26-.49) and complex story (.49-.71). These correlate at a statistically significant level with scores on the *CELF-P:2*. With regard to construct validity, a developmental trend was found up to age 7 years for simple and 8 years of age for complex stories. Children with language impairments had lower scores than typically developing children. There is also concurrent validity available for the first mentions (another standard score), which ranges between .48 and .52. There are a number of analyses that can be used with the *ENNI,* several of which were normed. Normative information was collected from the Edmonton, Alberta, Canada geographical region. Although the population for which this test will be used in the current study is not identical, it represents a similar social-economic status and the participants on whom the ENNI was normed were speakers of Canadian English. In addition, the data was normed using all three of the stories in each set. Because only one narrative was transcribed and analyzed at pre-and post-testing for this study, standardized scores were not used. In lieu of standardized scores, raw scores were used and included mean length of utterance (MLU), number of different words (NDW), and type-token ratio. These three measures are considered valuable assessments of vocabulary production. The final narrative of each story set was

selected for transcription for two reasons: 1) three narratives were elicited prior to the last story which allowed for multiple opportunities for practice, 2) the last story in each set is considered the most complex in terms of story development. The assessment is designed for children ranging in age from 4 to 9 years. This assessment is deemed appropriate for this study given the constructs it measures and the moderate to strong reliability and validity measures.

Table 4: Dependent Variables: Standardized and Non-Standardized Measures

Assessment	Domain	Variable
Standardized		
Pre-Reading Inventory of Phonological Awareness (PIPA)	Phonological Awareness	Raw Score
Expressive Vocabulary Test-2nd Edition (EVT-2)	Expressive Vocabulary	Raw Score
Peabody Picture Vocabulary Test-4th Edition (PPVT-4)	Receptive Vocabulary	Raw Score
Clinical Evaluation of Language Fundamentals-Sentence Structure Subtest (CELF-P:2)	Listening Comprehension	Raw Scores
Non-Standardized		
Word Attribute Identification Task	Lexical & Sublexical Knowledge	Mean Percent Correct
Word Association Task	Lexical Knowledge	Rate of Response
Edmonton Narrative Norms Instrument (ENNI)	Oral narratives (use of vocabulary)	MLU, NDW. TTR

MLU = Mean Length of Utterance; NDW = Number of Different Words; TTR= Type-Token Ratio

Intervention Procedure and Materials

The intervention was delivered in two different formats two days a week for 10 weeks. The entire class (experimental group) received whole-group instruction on Wednesday of each week of the intervention phase during their scheduled "circle

time." The instructor taught two letters/sounds per week. When introducing a new letter and sound, the instructor presented a large printed letter that hung prominently on the backdrop for the duration of the instruction. The instructor then pre-taught the vocabulary words that were found in the book that followed. These books contained a variety of words that begin with the targeted sound. After each page was read, the instructor prompted the students to identify words that start with the target sound. A total of twenty books were written and illustrated specifically for the purposes of this instruction. Books were no longer than 5 pages in length with one to three lines of text per page. An example of a book is included in the Appendix.

Two structured games immediately followed the book reading. The first game addressed phonemic awareness, specifically initial phoneme identification. Using a hanging pocket organizer, the instructor presented three pictures to the class. Some pictures were directly from the book and some are not. The pictures did not contain the written form of the word. The instructor asked the students to identify which word begins with the target sound out of a field of three pictures. This is repeated for another round of words. The next two rounds of the game asked the students to identify which words did *not* begin with the target sound. One foil was included in this round meaning that one picture did begin with the target sound, but it was not from the book.

The second game was an interactive vocabulary game. The vocabulary word was directly related to the book, as well. For instance, if the target sound was /d/ and the book was about a *dog*, then the vocabulary game focused on the lexical and

sub-lexical concepts associated with the word *dog.* The instructor used a 2x2 grid (as shown in Figure 1) on a large felt mat to divide four concepts related to the vocabulary word. This game was referred to as "Four Corners". For example, in one corner, the class discussed the semantic features of the word *dog* using pictures including size, color, sounds, and parts of the whole. The next corner addressed the function or location (or both) of the word *dog*. The third corner addresses the word associations of the word *dog*. The fourth corner uses pictures to teach words that rhyme with *dog*. The dialogue within this game offered multiple opportunities for further semantic elaborations (e.g., "A dog has paws. He uses them to dig."). Student comments and questions that reflected semantic, phonemic awareness, or narrative related features were reinforced with positive responses from the instructor. Formal lesson plans and dialogic scripts were written in advance. Large group instruction was video recorded in order to examine treatment fidelity.

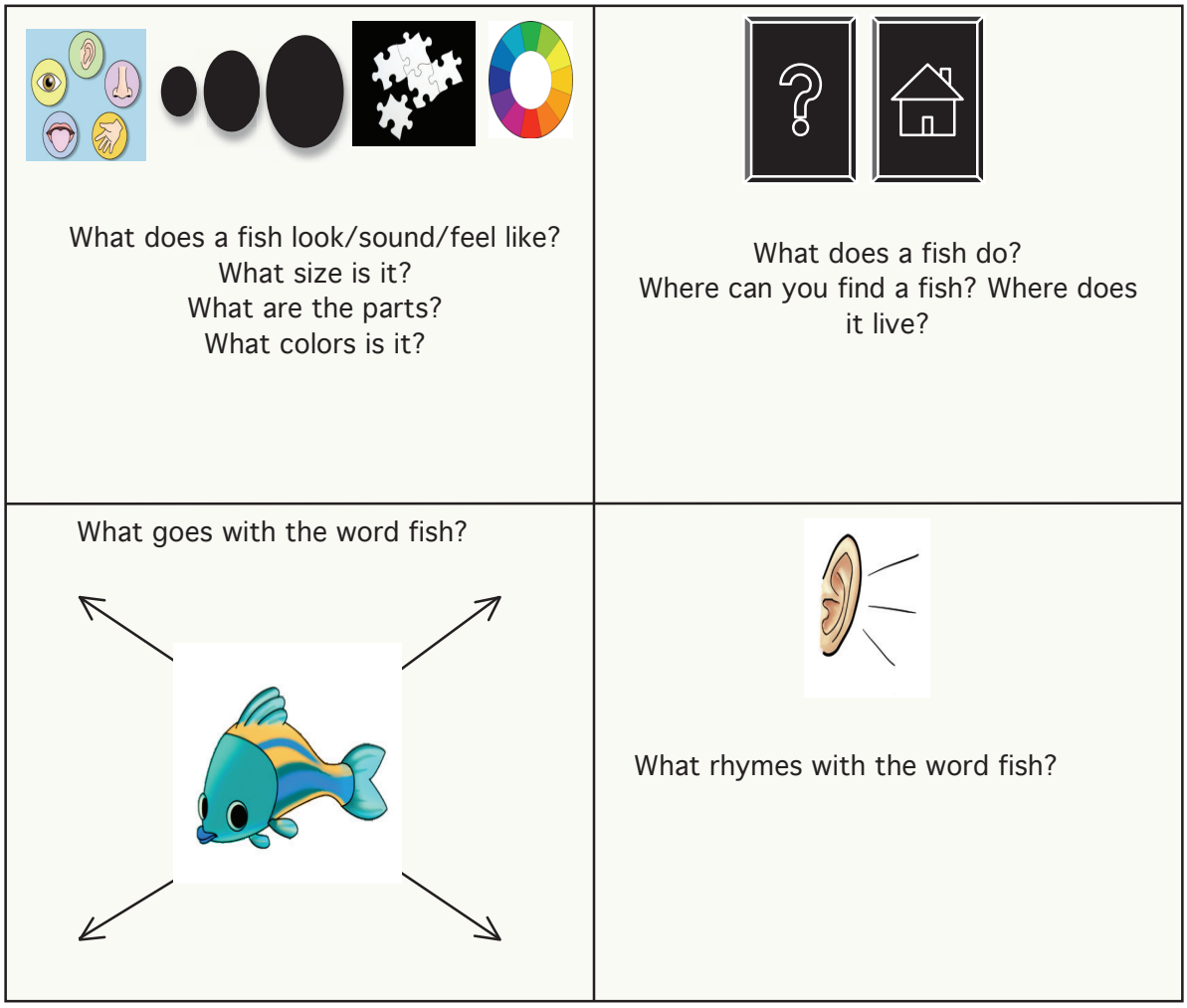


Figure 1: Model of Instructional Grid and Visuals

As the weeks continued, new phonological awareness concepts were added to the curriculum in the first part of each lesson. These concepts followed the phonological awareness hierarchy as outlined by Pufpaff (2009). Note that rhyme awareness is targeted each week as part of the "Four Corners" game. The weekly curriculum is outlined below:

Week 1: Phoneme Awareness

Week 2: Phoneme Awareness

Week 3: Phoneme Awareness and Syllable Segmentation

Week 4: Phoneme Awareness & Syllable Segmentation

Week 5: Phoneme Awareness & Syllable Segmentation

Week 6: Phoneme Awareness & Syllable Segmentation

Week 7: Phoneme Awareness & Phoneme Blending

Week 8: Phoneme Awareness & Phoneme Blending

Week 9: Phoneme Awareness & Phoneme Segmentation

Week 10: Phoneme Awareness & Phoneme Segmentation

For items that targeted syllable segmentation, phoneme blending, and phoneme segmentation, a number of visual supports were used. For syllable segmentation, each student received a laminated strip of paper with five large colored circles (Figure 2). The instructor guided the students to use the circles to tap out the syllables, followed by the option to clap out the syllables. For phoneme blending and segmenting, students were shown large laminated sheets of paper where each sheet represented a phoneme. For blending, the instructor would move the sheet of paper down the display as each phoneme was spoken. Once a few students had turns to answer, the instructor would write the letters of the sounds on the sheets of paper and repeat the segmentation and blending in order for students to see the letter-sound relationship. For segmenting, the instructor would lay blank sheets on the floor and students would manipulate the sheets to segment the sounds. After a few correct trials had been completed, the instructor would

write the letters on the sheets of paper and repeat the whole-word to segmentation process.

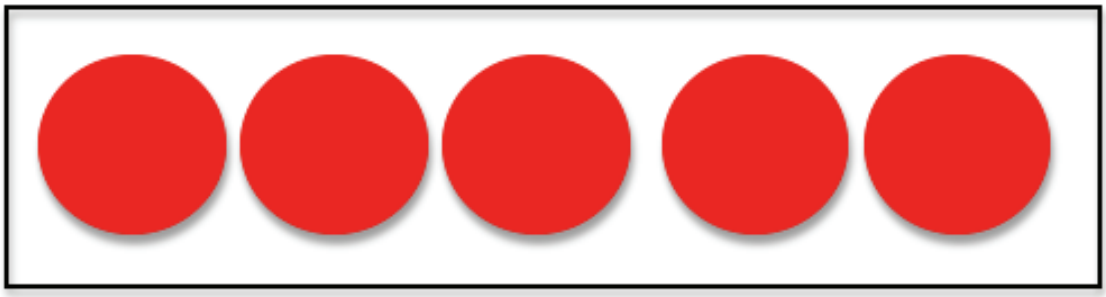


Figure 2: Visual Tools for Syllable Segmentation

On Day 2 instruction, which immediately followed the Day 1 of large group instruction, the same instructor followed the same lesson plan for phonological awareness with small groups of three to four. The book was used as a review of the vocabulary and initial sound awareness; however, the full vocabulary lesson with the explicit instruction of the semantic features was not repeated due to time limitations. The instructor used the same script for the PA lessons. Groups changed on a weekly basis to accommodate classroom needs and other unrelated variables, and consisted of a mix of typically developing students and students with communication disorders. The purpose of the small-group instruction was twofold: (1) to review the material taught in the whole-group instruction the previous day, (2) to serve as a more intensive instruction, as whole-group instruction in isolation has been found to be less effective than small-group instruction when teaching phonological awareness.

Treatment Fidelity

Treatment fidelity was evaluated by an independent speech-language pathology graduate student to determine the consistency of the instruction for all portions of the large group instruction including the storybook reading and questions, the phonological awareness games, and the vocabulary games. Two large group session videos (20% of the intervention) were chosen at random and given to the evaluator along with the lesson plans. The evaluator then observed each video and code each utterance using the following categories: 1) Reflected lesson plan, 2) Response to child's comment or child's questions, 3) Behavioral support/redirection, 3) Other. The "Other" category consisted of utterances that were directed at the classroom teacher for clarification or others adult staff who may have been present in the classroom.

For the two sessions observed, the percentages of utterances that reflected lesson plans was 46% and 53%. The percentages observed for utterances that related to a child's comment or question was 30% and 36%. Utterances that addressed behavior were observed in 22% and 8% of all the utterances and 3% of utterances in both sessions were observed as "other." These results show that on average, lesson-related utterances accounted for 83% of the total number of utterances spoken by the instructor. This supports the notion that the intervention was carried out with fidelity and that the majority of the sessions were child-focused with much of the interaction focusing on teaching or responding to child-initiated comments or questions.

The format of intervention followed principles highlighted by McGregor & Leonard (1995 as cited in Munro, Lee & Baker, 2008). The use of card/board games increases treatment intensity, which is consistent with the idea that children with speech sound disorders and ASD (and SLI) need frequent or intense exposure formats (Ukrainetz, 2006, as cited in Munro et al., 2008). Previous studies showed modest vocabulary outcomes when shared story intervention was used without intense format instruction (Dale, Crain-Thoreson, Notari-Syverson, 1996). Children with language impairment are more engaged in games versus books alone (Kaderavek and Sulzby, 1998, as cited by Muno et al., 2008). This is also likely true for students with autism, as well.

Control Group

The control group received "treatment as is," which consisted of a modified version of "Handwriting Without Tears." On a weekly basis, the teacher would use the materials from this program to set up a table as a choice during center-time. The teacher would show students how to form a letter on a small chalkboard with a sponge and draw it in sand. The teacher and student would talk about the sound the letter makes and then name a few words that start with that sound. This tabletop activity lasted roughly 10 minutes and was done in small groups. Those in the experimental group also received this same instruction in addition to the weekly intervention presented in this study.

Statistical Analysis

Statistically significant differences were not found between groups at baseline; thus independent t-tests were used to compare the pre-post difference between groups (Lecture notes, Wells, 2010). Since there are multiple dependent variables, familywise error rate had to be controlled (i.e., controlling for multiple Type I errors for each comparison). The Dunn-Bonferroni method was administered for this purpose.

Effect sizes for statistically significant differences were computed using Cohen's D statistic. This statistical test divides the differences in means by the standard deviation pooled (e.g., how much variance is in the variable). An effect size may be considered small, medium, or large, .2-.5, .5-.8, >.8, respectively.

Percent correct scores were calculated for the *word attribute identification task* from pre to post test dates for semantic and sublexical trained and untrained items. Independent t-tests were computed for multiple comparisons on the *word attribute* task using differences in means from pre- and post- testing. Cohen's D will be used to calculate effect size. For the *word association task,* the total number of responses for each category was divided by the total number items given to each student (12 at pre, 16 at post). Independent t-tests were also used to measure the difference in means of both groups. This measured the potential change in types of responses post treatment.

Although Keppner (1999) states that history, maturation, and testing are not likely threats, threat-by-selection is possible; this can lead to a risk to internal validity. For instance, one group may have matured faster than the other or one

group may have encountered a historical event that the other may not have (although because they are in the same school, the latter is a minor threat). The study may have been vulnerable to threats of external validity including testing sensitivity. Given that the students were very young, most types of interaction threats were unlikely. That is to say that discussions about the intervention between the control group and intervention group were unlikely to occur because of their young age. However, the fact that the classroom teacher was the same for both the control group and the treatment group might have caused one type of interaction threat if she were to have adjusted her teaching in the control group classroom as a result of observing the intervention that the treatment group receives. To control for this, the teacher was observed when teaching the control group the "treatment as usual." This threat is also unlikely because the intervention materials were collected at the end of each session and removed from the classroom by the principle investigator; therefore, the teacher did not have access to the appropriate treatment tools.

CHAPTER 5

RESULTS

Results

Results of this study will be reported in the sections that follow, including between-group results, as well as results of those individuals with communication disorders within the experimental group. Pre- and post-differences in performance will be reported on standardized measures, non-standardized clinical tasks, and narratives administered over the course of the study. Observational differences will also be presented in this section for individuals with communication disorders.

Between-Group Results: Standardized Measures

A total of four standardized tests were administered including the *Peabody Picture Vocabulary Test-4th Edition (PPVT-4), Expressive Vocabulary Test (EVT), Clinical Evaluation of Language Fundamentals-Preschool: 2nd Edition (CELF-P:2*) (*Sentence Structure* subtest only), and the *Preschool Inventory of Phonological Awareness (PIPA).* Each test battery was administered to each student prior to the intervention at the beginning of the study and again at the end of study, approximately ten to fifteen weeks later. Results of the standardized measures at pre- and post-intervention were compared using raw scores.

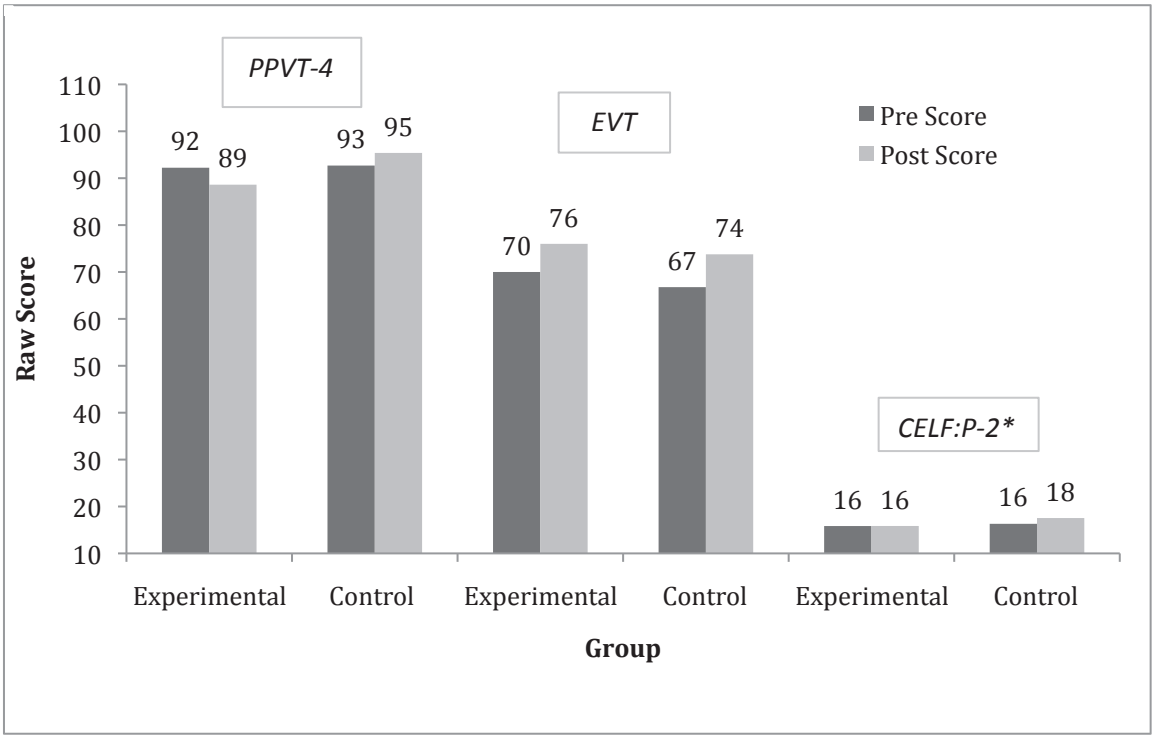
Table 5 presents the results of independent *t*-tests and significance levels for comparing the two groups' performance on measures of expressive and receptive vocabulary and listening comprehension. At baseline, the experimental group and the control group showed relatively equivalent means for the *PPVT-4*, with mean scores of 92.23 (*SD = 24.60*) and 92.69 (*SD = 24.08*), respectively. Pre-test results on

the *EVT* were slightly different between groups with the experimental group averaging a raw score of 70.0 (*SD = 12.75*), and the control group demonstrating a mean of 66.77 (*SD = 17.11*). Both groups also demonstrated similar scores at baseline for listening comprehension with a mean raw score of 15.83 (*SD= 5.41*) for the experimental group and 16.31 (*SD = 3.88*) for the control group. Using a significance level of 0.05, the results show that there were no statistically significant discrepancies in performance between the experimental group and the control group on measures of vocabulary and listening comprehension. Figure 3 is a side-by-side visual comparison on pre- and post-scores for three standardized measures including the *PPVT-4, EVT*, and *CELF:P-2*.

Table 5: Results for Standardized Measures of Vocabulary and Listening Comprehension at Pre- and Post- Intervention (n = 26)

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences Pre- and Post-	SD Pre- and Post-	t	Sig.
PPVT-4								
Experimental	92.23	24.60	86.62	27.77	-3.61	20.65	-1.27	.107
Control	92.69	24.08	95.38	21.44	2.69	21.44		
EVT								
Experimental	70.0	12.85	76.0	19.88	6.00	17.51	.832	.423
Control	66.77	17.11	73.77	16.58	7.00	5.60		
CELF-P:2								
Sentence Structure								
Experimental	15.83	5.41	15.85	6.31	-0.166	4.89	-.870	.196
Control	16.31	3.88	17.54	2.76	1.23	2.62		

α = 0.05; SD, standard deviation



* Highest possible raw score is 20

Figure 3: Pre and Post Raw Scores for PPVT-4, EVT-2, and CELF:P-3 by Group (n=13)

Table 6 presents the results of independent *t*-tests and significance levels for measures of phonological and phonemic awareness as measured by the *PIPA*. The results of these *t*-tests show that there were no statistically significant changes in pre- and post-performance between the two groups. Figure 4 is a visual comparison of each subtest of the *PIPA* at each date of testing for both groups.

Table 6: Results of the PIPA Subtests at Pre- and Post- Intervention (n=26)

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences Pre- and Post-	SD Pre- and Post-	*t*	*Sig.*
Rhyme Awareness								
Experimental	4.7	3.27	6.54	3.71	1.77	3.09	.290	.387
Control	4.69	3.07	6.15	2.12	1.46	2.26		
Syllable Segmentation								
Experimental	6.31	3.92	7.69	3.86	1.38	3.64	-.06	.476
Control	5.77	2.28	7.23	3.72	1.46	2.82		
Alliteration Awareness								
Experimental	3.23	3.24	4.54	3.84	1.31	1.55	1.08	.14
Control	3.77	2.62	4.31	2.66	0.54	2.03		
Sound Isolation								
Experimental	3.69	4.52	5.08	4.37	1.38	3.62	-.31	.378
Control	2.77	3.39	4.54	3.91	1.77	2.55		
Sound Segmentation								
Experimental	0.38	0.77	0.62	1.19	0.23	1.17	1.33	.097
Control	0.54	1.39	0.15	0.38	-0.38	1.19		
Letter-Sound Knowledge								
Experimental	4.15	6.73	7.85	6.99	3.69	3.35	.130	.44
Control	2.31	3.15	5.85	5.08	3.54	2.67		

$\alpha = 0.05$; SD, standard deviation

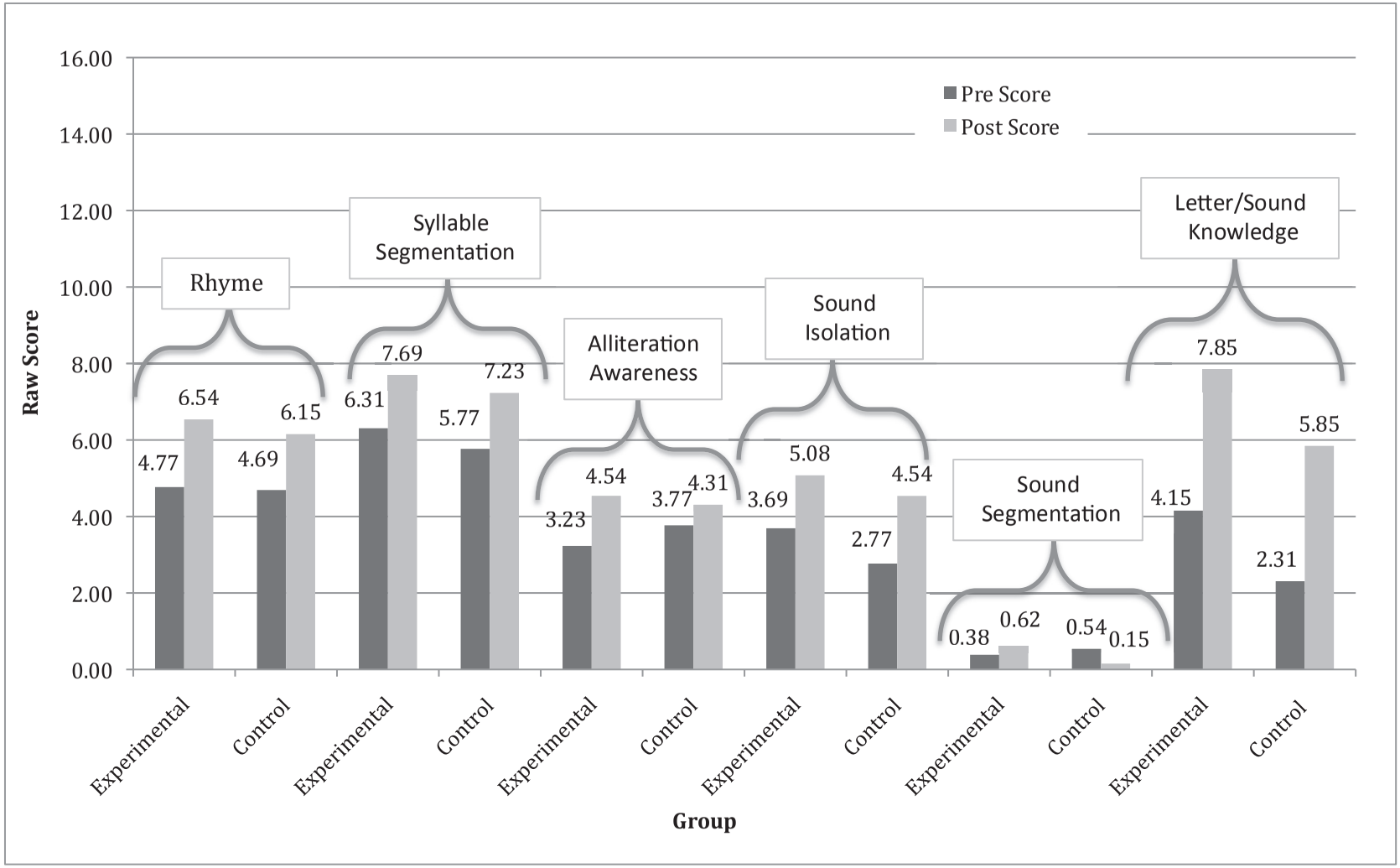


Figure 4: Results of the PIPA Subtests at Pre-and Post-Intervention for Both Groups (n =26)

Between-Group Measures: Non-Standardized Tasks

Word Attribute Identification Task

The results of the non-standardized tasks at pre- and post-intervention were compared. The *word attribute identification task* examined both lexical and sub-lexical knowledge of 36 words, 18 trained and 18 untrained. For the experimental group, on items pertaining to semantic attributes (e.g., "Which one goes with farm?") for *trained* words, the mean correct performance improved from 68% to 80.3% from pre- to post-intervention. In contrast, the mean correct performance for the control group decreased from 82.96% to 78.61% for the same set of words. For *untrained* words, mean correct performance on items pertaining to semantic attributes improved slightly for both the experimental group (88.7% to 94.0%) and the control group (89.8% to 93.2%). Items measuring sub-lexical knowledge, or phonological awareness, were also divided into *trained* and *untrained* sets of words. The experimental group showed a substantial gain in the mean correct performance on *trained* words from pre- to post-intervention from 36.0% to 73.0%. Mean correct performance for the control group on *trained* sub-lexical items decreased from 64.8% to 29.2%. For *untrained* words in the sub-lexical items, the experimental group demonstrated improvement from 39.7% to 51.3%. For the same items, the control group stayed the same (48.61% to 48.8%).

Results of the word attribute task were analyzed using independent *t*-tests. Using a significance level of 0.05, the results show a statistically significant difference between groups for trained items. The experimental group showed significant gains in performance at post-intervention for semantic items ($t = 2.03$, p

= .05) with a medium effect size (ES = .80) and phonological awareness items (t = 4.67, p = .00) with a large effect size (ES = 1.8). There were no significant differences between groups for untrained semantic (t =.294, p = .77) and phonological awareness items (t = -1.05, p = .30). Results indicate that the experimental group showed improvement in understanding lexical-semantic and sub-lexical features (phonological awareness) of words to which they were exposed during the intervention. Table 7 summarizes the mean correct performance between the two groups at pre- and post-intervention.

Table 7: Results of the Word Attribute Identification Task: Mean Correct Performance on Semantic and Phonological at Pre- and Post-Intervention

Word Attribute Task	Pre Mean Correct Performance (SD)	Post Mean Correct Performance (SD)	*t*	*Sig.*	Effect Size
Semantic Attributes Trained					
Experimental	68.0 (23.4)	80.3 (15.5)	2.03	.05	.80
Control	82.96 (14.5)	76.61 (13.18)			
Semantic Attributes Untrained					
Experimental	88.7 (15.7)	94.0 (15.4)	.294	.77	n/a*
Control	89.8 (18.2)	93.2 (6.7)			
PA Attributes Trained					
Experimental	36.0 (25.94)	73.0 (25.9)	4.67	.00	1..8
Control	64. 8 (18.2)	29.2 (23.4)			
PA Attributes Untrained					
Experimental	39.7 (26.8)	51.3 (36.9)	-1.05	.30	n/a*
Control	48.61 (34.28)	48.8 (20.3)			

α = 0.05; SD, Standard Deviation;* Effect size was not calculated because no statistical differences were found

Word Association Task

The *word association task* was administered to each student at pre- and post-intervention. Ten high-frequency nouns and two adjectives were included in the measure at pre-intervention. High-frequency words were selected from *The Educator's Word Frequency Guide* (Zeno, Ivens, Millard, & Duvvuri, R. 1995). At post-intervention, the same words were included, as well as four words that were directly targeted during the intervention (*surfer, zoo, baby*, and *garden*). Students were read the following directions: "I'm going to say a word. When I say 'go' I want you to name all the things that go with that word. Let's try some together." The students then had two trial items to practice the task. Students had twenty seconds for each stimulus word. Each response was coded into six possible categories with some words falling into two or more categories. For instance, if the stimulus word was *baby* and the student said "bottle," the word could be categorized as syntagmatic due to the likelihood that *bottle* and *baby* could be found in the same sentence and clang due to the alliterative relationship.

All words that were coded as multiple word responses were also coded as paradigmatic or syntagmatic. For instance, if the stimulus word was *car* and the response was "drive the car" then the response would be coded as multiword-syntagmatic. If the response was "cars and trucks" the response would be coded as multiword-paradigmatic since cars and trucks are coordinates. The majority of the responses were single-word utterances for both groups at both pre-and post-intervention, with the largest category being syntagmatic. Of the responses that were multiword, the majority of them were multiword syntagmatic.

Two analyses were used to identify changes in performance on the word association task. The first analysis examines the rate of responses for each category. To measure this, the total number of responses from each student for each category was divided by the total number of items given to each student (12 at pre, 16 at post). Independent t-tests were also used to measure the difference in means of both groups. These reflected the potential changes in types of responses post treatment.

On average, the experimental group responded with paradigmatic responses at an overall rate of 0.33 at baseline and 0.37 after the intervention. The control group responded with a slightly higher average paradigmatic response rate of 0.42 at the first time of testing followed by a decreased rate of 0.33 at the second time of testing. The average baseline rate of response of syntagmatic answers for the experimental group was 1.88 and 2.00 at post-testing. For the same category, the control group demonstrated an average rate of 1.32 at pre-testing and 1.64 at post-testing. Clang responses, or responses that rhymed or shared an alliterative relationship with the target word, were produced at an average rate of 0.20 at pre and 0.22 at post for the experimental group, demonstrating little change. In contrast, the control group decreased the average rate of clang responses from pre to post from 0.55 to 0.07. Repeated responses increased for both groups from pre to post with the experimental group averaging a rate of 0.18 at baseline and 0.22 following the intervention. The control group showed an increase in response of repeated words with an average rate of 0.12 at the start of the study and 0.33 at the end. The experimental group did not produce multiple-word responses of the

paradigmatic kind at baseline, but showed a slight increase in multi-word paradigmatic response rate of 0.01 at post-testing. Rates were similar for the control group for this category, starting with an average baseline rate of 0.03 and a rate of 0.01 at the end of the study. Multiple-word responses of the syntagmatic kind were higher with the experimental group showing a rate of 0.17 at pre and 0.24 at post. On average, the control group produced 0.22 multiple-word-syntagmatic answers per question at the start of the study and 0.25 such answers on average at baseline. Responses that were considered "not related" were relatively high for both groups. For the experimental group, the average rate of unrelated responses at both pre- and post-testing was 0.35. The control group's rate of response for this category increased from 0.11 to 0.32. Independent t-tests were used to analyze the differences in rate between the two groups from pre to post testing. No statistically significant differences were found on any of these comparisons. Table 8 is a summary of these results.

Table 8: Results of the Word Association Task: Pre-Post Differences in Mean Overall Rate of Response Rate Per Category

Category	Pre Mean Response Rate	Post Mean Responses Rate	Differences from Pre to Post	*t*	*Sig.*
Paradigmatic					
Experimental	0.33	0.37	0.04	.837	0.13
Control	0.42	0.33	.09		
Syntagmatic			0.12		
Experimental	1.88	2.00		-.50	0.31
Control	1.32	1.64	0.32		
Clang					
Experimental	0.20	0.22	0.02	1.28	0.10
Control	0.55	0.07	-0.48		
Repeated					
Experimental	0.18	0.30	-.012		
Control	0.12	0.33	0.21	-.55	.29
Multiple Word-Paradigmatic					
Experimental	0.00	0.01	-0.01	1.43	.08
Control	0.03	0.01	0.02		
Multiple Word-Syntagmatic					
Experimental	0.17	0.24	0.07	2.99	.38
Control	0.22	0.25	0.03		
Not Related				-.90	0.19
Experimental	0.35	0.35	0.0		
Control	0.11	0.32	0.21		

The second analysis examined the percentage of each category among all of the responses for each child at pre and post testing. The purpose of this analysis was to identify the differences in the overall quality of responses on average for both groups, as well as for the individuals with communication disorders (as discussed below). For instance, an increase in the percentage of syntagmatic or paradigmatic responses post-testing would reflect more appropriate responses, as would a decrease in the percentage of "not related" responses. Given that word associations were directly taught during the intervention, the experimental group was expected to show an increase in more mature response categories. No

significant differences were found between the two groups. Results of this analysis are summarized in Table 9.

Table 9: Word Association Task: Pre-Post Differences in Mean Percentage Per Category

Category	Pre Mean Percentage	Post Mean Percentage	Difference from Pre to Post	*t*	*Sig.*
Paradigmatic					
Experimental	10.05 %	11.40 %	1.35	1.15	.13
Control	16.38 %	11.09 %	-5.26		
Syntagmatic					
Experimental	52.36 %	55.15 %	2.79	.12	.45
Control	47.6 %	49.3%	1.70		
Clang					
Experimental	12.61 %	7.04 %	-5.57	.39	.35
Control	13.61 %	3.44 %	-10.17		
Repeated					
Experimental	5.82 %	9.11 %	3.29	-.70	.25
Control	6.03 %	11.73 %	5.70		
Multiple Word-Paradigmatic					
Experimental	0.00 %	0.50 %	0.50	1.36	.09
Control	1.63 %	0.47 %	-1.16		
Multiple Word-Syntagmatic					
Experimental	4.83 %	6.18 %	1.38	.75	.23
Control	11.25 %	8.95 %	-2.30		
Not Related					
Experimental	8.24 %	5.71 %	-2.53	-.75	.23
Control	10.35 %	13.4 %	3.05		

Narratives

Using *The Edmonton Narrative Norms Instrument (ENNI)*, each student was given a trial set of picture prompts followed by three sets of picture prompts, each one increasing in length. Due to the length of the prompt and opportunities to practice, the last of the three narrative samples from each child at pre- and post-intervention testing were used for this study. Narratives were transcribed and coded using the SALT software and analyzed to examine the following: Mean Length

of Utterance (MLU), Number of Different Words (NDW), and Type-Token Ratio (TTR).

Table 10 is a summary of the descriptive data for narrative measures. Mean length of utterance was chosen as a metric measure of the children's grammatical skills. At pre-intervention, the average MLU for the experimental group was 6.24 with a standard deviation of 1.77. At post-intervention, the average MLU for the experimental group was 6.47 with a standard deviation of 1.64. The control group also increased in average MLU from 5.73 (*SD* =1.18) to 6.08 (*SD*=1.62). An independent t-test of pre and post mean differences did not indicate a statistically significant difference between the two groups (t = -2.06, p = 4.19).

Number of different words was selected as an index of the quality of the children's stories. The average NDW for the experimental group at pre-intervention was 34.81 (*SD*=5.81). Following the intervention, the average NDW for the experimental group increased to 43.64 (*SD*=15.05), with a mean difference of 8.81 (*SD*=12.20). The control group also made gains with an average of 36.82 (*SD*= 14.22) for NDW at pre-intervention and an average of 42.67 NDW (*SD* 14.22) post-intervention, with a mean difference of 6.81 (*SD*=11.76). There was no statistically significant difference between groups at post-intervention (t = 0.391, p = 0.35).

Finally, the type-token ratio was selected to measure the vocabulary variation within the children's narratives. The experimental group had a relatively low average TTR of 0.44 (*SD*=0.06) at the onset of the study and made a slight gain with an average TTR of 0.46 (*SD*=0.06*)* at the end of the intervention. The control

group also started with a low TTR of 0.46 and ended with a final average TTR of 0.50.

Table 10: Results of Narrative Task

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences	SD	*t*	*Sig.*
MLU								
Experimental	6.24	1.85	6.47	1.64	0.36	1.17		
Control	5.73	1.18	6.08	1.62	0.48	1.55	-.206	.419
NDW								
Experimental	34.81	5.81	43.64	15.05	8.81	12.20		
Control	36.82	14.22	42.67	14.22	6.81	11.76	.391	.35
TTR								
Experimental	0.44	0.07	0.46	0.07	0.01	.10		
Control	0.46	0.65	0.51	0.07	0.04	.08	-.883	.19

$\alpha = 0.05$
SD, standard deviation

Results for Individuals with Communication Disorders

Results for the five students with communication disorders in the experimental group were examined as individual participants in order to further assess the effectiveness of the intervention.

Student 1

Student 1, a male, was 4 years, 3 months at the beginning of the study. Permission to access this student's Individualized Educational Program (IEP) for the purposes of this study was denied; thus, the precise reasons for special education services cannot be reported. Upon observation, Student 1 had some developmental sound substitutions and some difficulty with multi-step directions. Attention was also inconsistent and overall compliance in the classroom was variable.

Student 1 was present for a total of 9 large group intervention sessions and 10 small group intervention sessions. It should be noted that Student 1 had

significant behavioral challenges at post-intervention testing for measures of receptive and expressive vocabulary and listening comprehension. Therefore the following scores are not an accurate representation of this student's skills. Student 1 showed a dramatic 46-point decrease in performance from pre- to post-intervention on the *PPVT-4* and a 10-point decrease on the *EVT* from pre-to post-intervention. On the *CELF-P:2*, Student 1 received a raw score of 16 at pre-intervention and a raw score of 2 at post-intervention.

Slight improvements were made in the areas of phonological awareness as measured on the *PIPA* with Syllable Segmentation and Letter-Sound Knowledge being the two subtests with the greatest gains. Figure 5 shows the changes in performance on each subtest from pre-to post-intervention for Student 1.

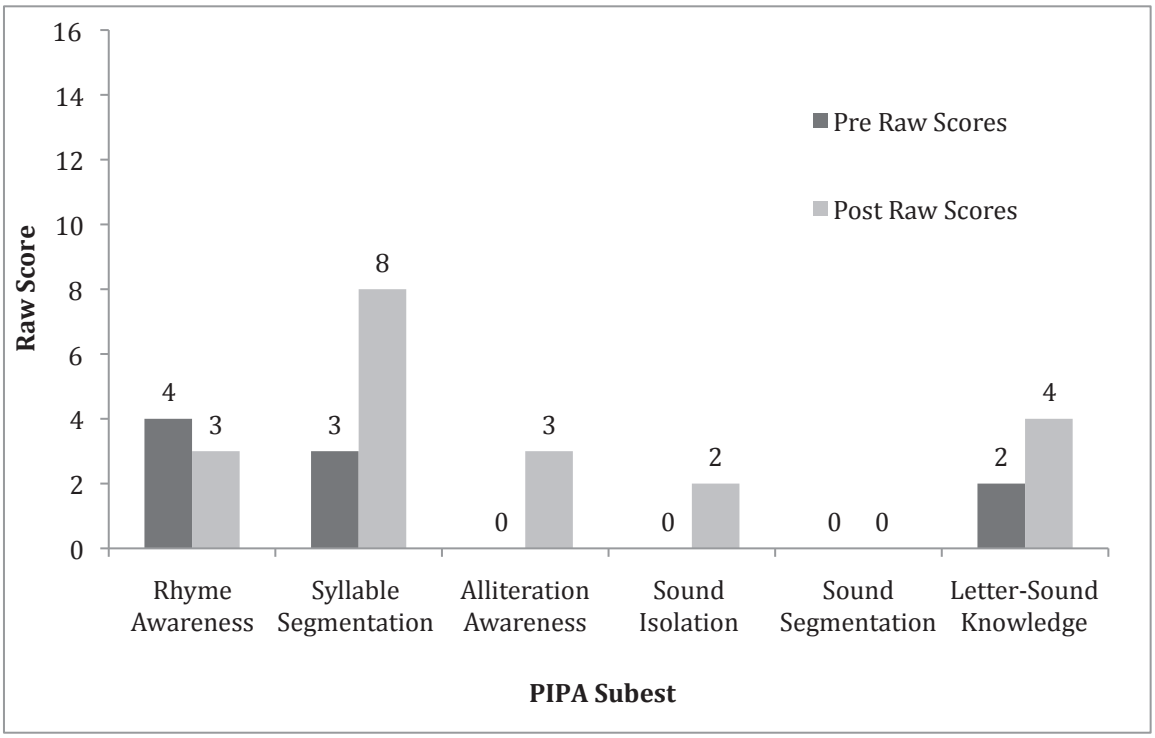


Figure 5: Student 1 Pre and Post Raw PIPA Scores

Student 1 also made gains on the *word attribute identification task.* At pre-intervention, Student 1 correctly answered 44% of the trained semantic items and 88.89% of the same questions at post-intervention. For untrained semantic items, he made gains from 77% to 100% pre-to post- intervention. Gains were made on items of sub-lexical knowledge with an increase from 33% to 66% for trained items and 16% to 66% for untrained items.

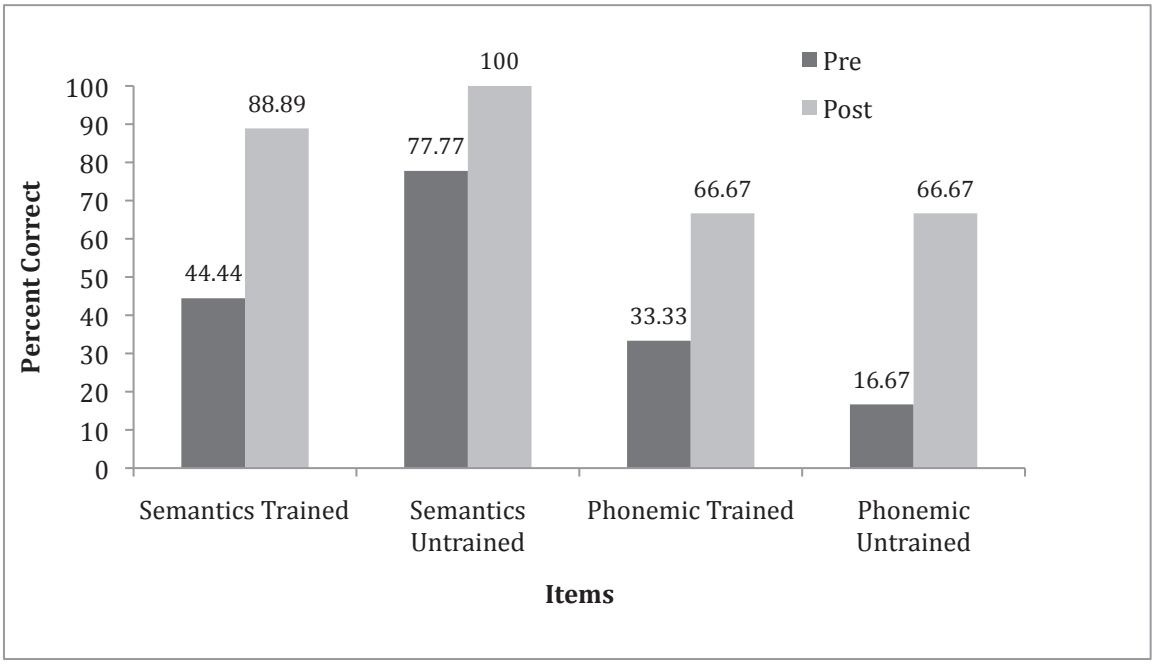


Figure 6: Student 1 Results of the Word Attribute Identification Task

With regard to the *word association task*, Student 1 did not increase his rate of response in the categories that are considered more mature (syntagmatic or paradigmatic). Additionally, his rate of response for words that were considered unrelated increased at post-testing. It is likely that his behavioral challenges at post-testing impacted his attention and, ultimately, his score. Figure 7 shows Student 1's performance on the word association task before and after the

intervention with regard to rate of responses. Figure 8 reflects similar results in the overall percentage of each category for all responses at pre and post testing. The majority of his responses did not indicate maturity or significant development of his lexical-semantic skills.

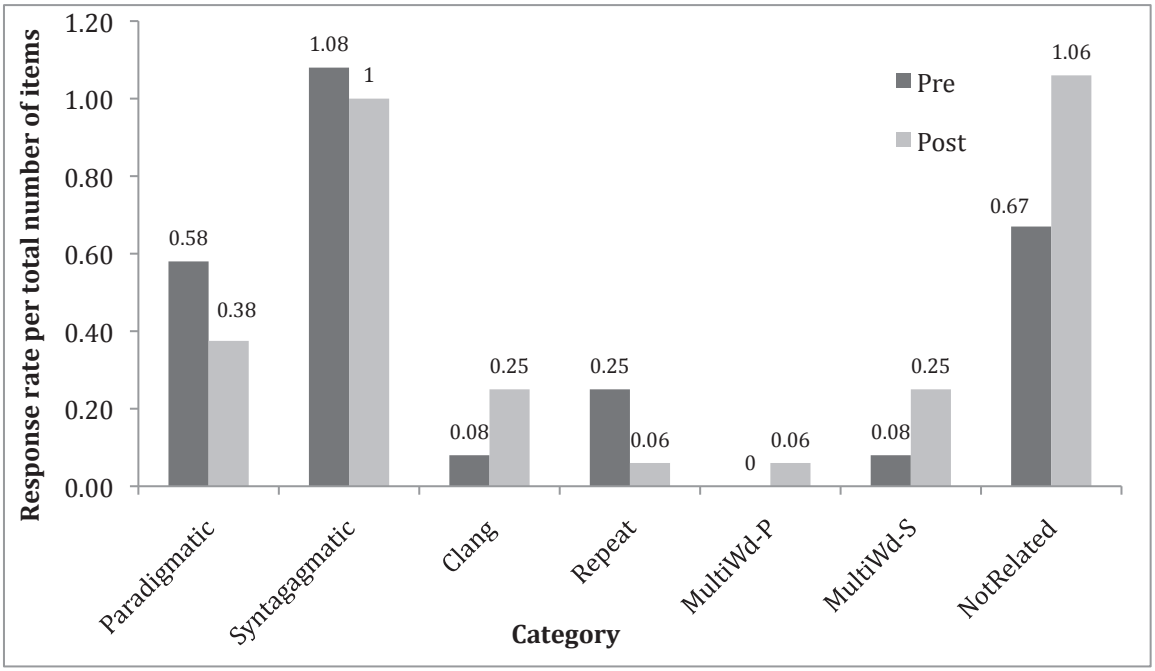


Figure 7: Student 1 Response Rate Per Total Number of Items by Category

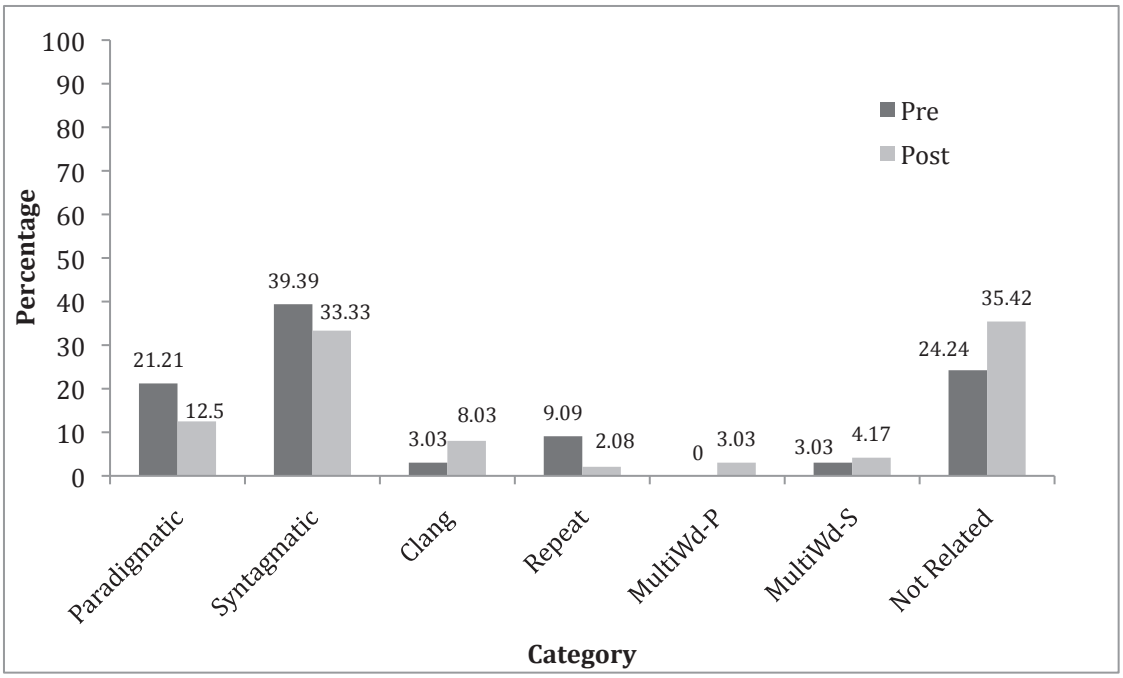


Figure 8: Student 1 Percentage of Each Category for All Responses

Of all the narratives in the experimental group, including those with communication disorders, Student 1 had the fewest number of different words (27) at baseline. At post-intervention, his NWD remained the lowest in the group, but increased to 31. Student 1's MLU decreased slightly from 4.83 to 4.42. A small decrease in TTR was also found (0.51 to 0.45).

Observations during intervention: Initially, Student 1 demonstrated a great interest in both the large and small group sessions. He was eager to participate and often answered both vocabulary-related and sub-lexical questions correctly. As the weeks continued Student 1 became reluctant to follow directions and became oppositional at times. This observation was consistent with his teachers' reports of his everyday classroom behavior as well. When Student 1 did participate, he was correct in responses, thus it is not the assumption that his participation was related

to the increasing difficulty of the material. It is hypothesized that outside factors were the main reason for his change in behaviors.

Student 2

Student 2, a male, was 5 years, 9 months at the beginning of the study. Student 2 had a diagnosis of autism and received speech-language services, as well as occupational therapy. Adaptive behavioral functioning was considered to be in the "low range", as were auditory comprehension and expressive communication.

Student 2 was present for a total of 9 large group sessions and 10 small group sessions. Not all testing could be completed largely due to Student 2's difficulty understanding the task and lack of attention during testing. Completed tests include the *PPVT-4*, *EVT*, the *CELF-P:2* subtest, and the *word identification task*. Student 2 was unable to complete the *PIPA*, the narrative task, and the *word association task*.

Performance at pre- and post-testing on the *PPVT-4* remained quite low with raw scores of 34 and 35, respectively. Raw scores for the *EVT* were somewhat higher, though still well below the average range, with a raw score of 41 at baseline and 44 following the intervention. Performance on the Sentence Structure subtest of the *CELF-P:2* improved from a raw score of zero to 4.

Small gains were seen on the *word attribute task.* Student 2 improved from 0% to 22.22% correct for trained semantic items and stayed at 44% correct for untrained semantic items. For sub-lexical items, Student 2 improved from 0% to 33% correct on trained sub-lexical items and remained at 0% correct for untrained sub-lexical items. Although changes were minimal, more changes were seen on

trained items versus untrained items. A summary of Student 2's performance can be seen in Figure 9.

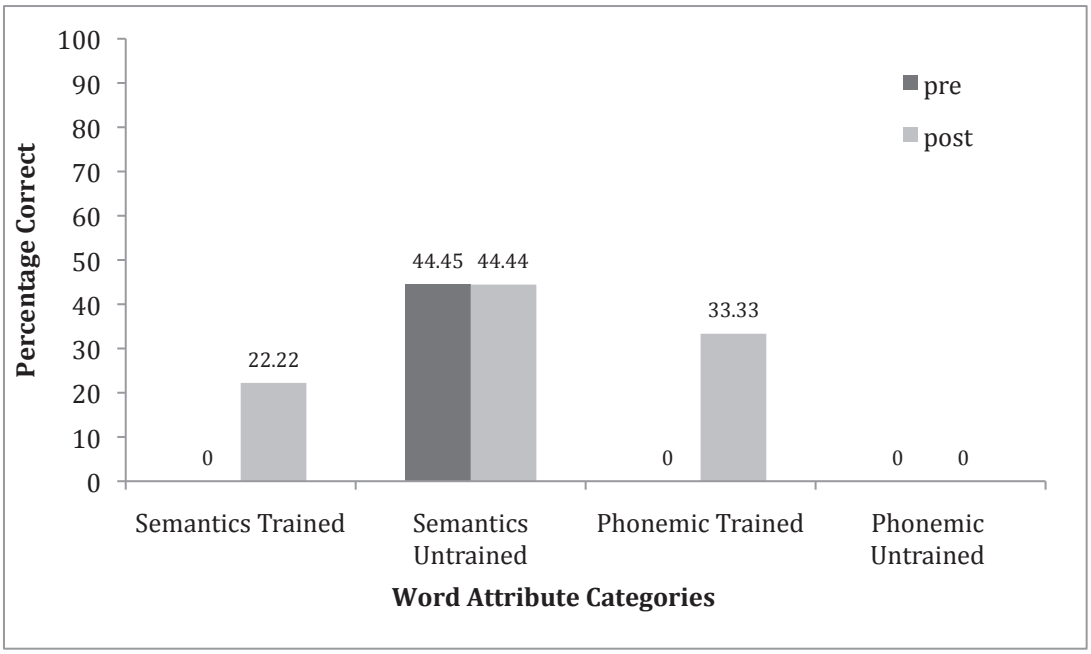


Figure 9: Student 2 Results of the Word Attribute Task

Observations during intervention: Student 2 required moderate to maximum scaffolding and prompting to answer questions, both lexical and sub-lexical, during the intervention. Providing two choices or cloze phrases improved the accuracy of responses. Other barriers during the intervention included attention and language skills. Student 2 often had to be redirected to the task during both the large and small group sessions.

Student 3

Student 3, age 5 years, 1 month, male, was receiving special education services due to a moderate overall delay of expressive and receptive language. Some phonological substitutions were also present. Student 3 was placed in the

language-based classroom for preschool for this purpose and received occupational therapy services, as well.

Student 3 was present for 8 large group sessions and 7 small group sessions. Gains were made on measures of receptive vocabulary with a 15-point improvement on the *PPVT-4* (63 to 78). Expressive vocabulary scores decreased slightly from 58 to 53 following intervention. A two-point gain was made on the *CELF-P:2* subtest with raw scores of 13 and 15. Results of the *PIPA* were varied. Results of the *PIPA* scores at pre- and post-intervention for Student 3 are displayed in Figure 10.

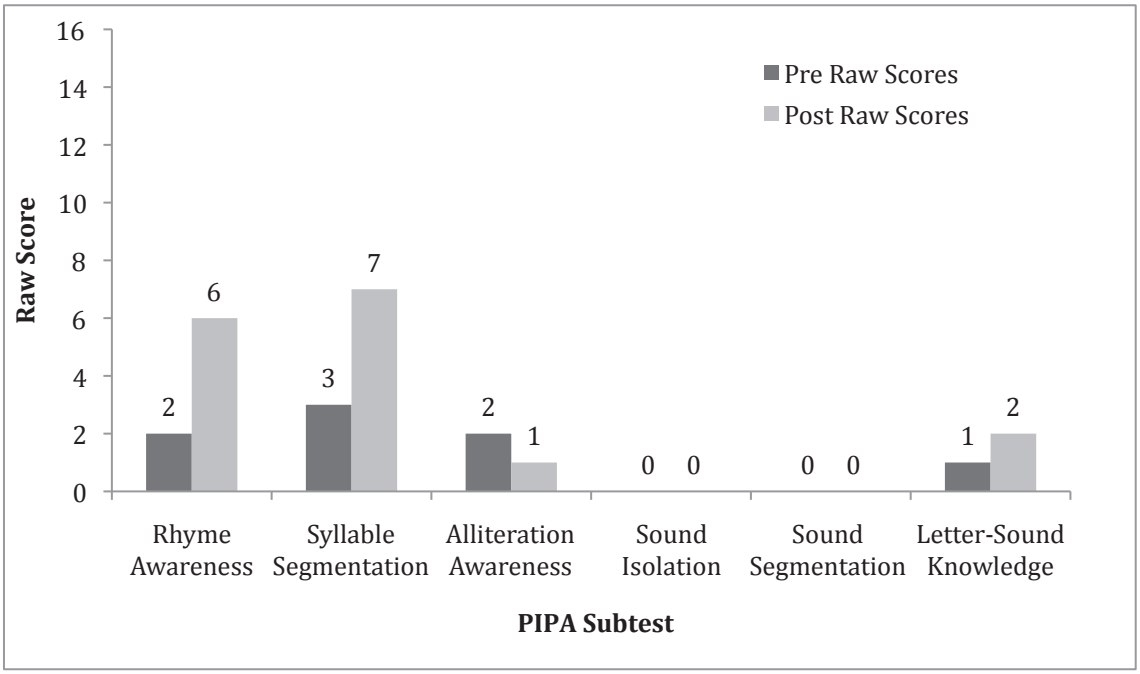


Figure 10: Student 3 Pre and Post Raw PIPA Scores

Baseline performance on the *word attribute* task was relatively high for semantic items at 77%. At post-intervention Student 3 answered 100% of the semantic items correctly, both trained and untrained. An improvement in phonological items was also observed for trained items with a percent correct score

rise from 33% to 100% at post-intervention for trained items. Performance on untrained sub-lexical items decreased from 33% to 0% correct.

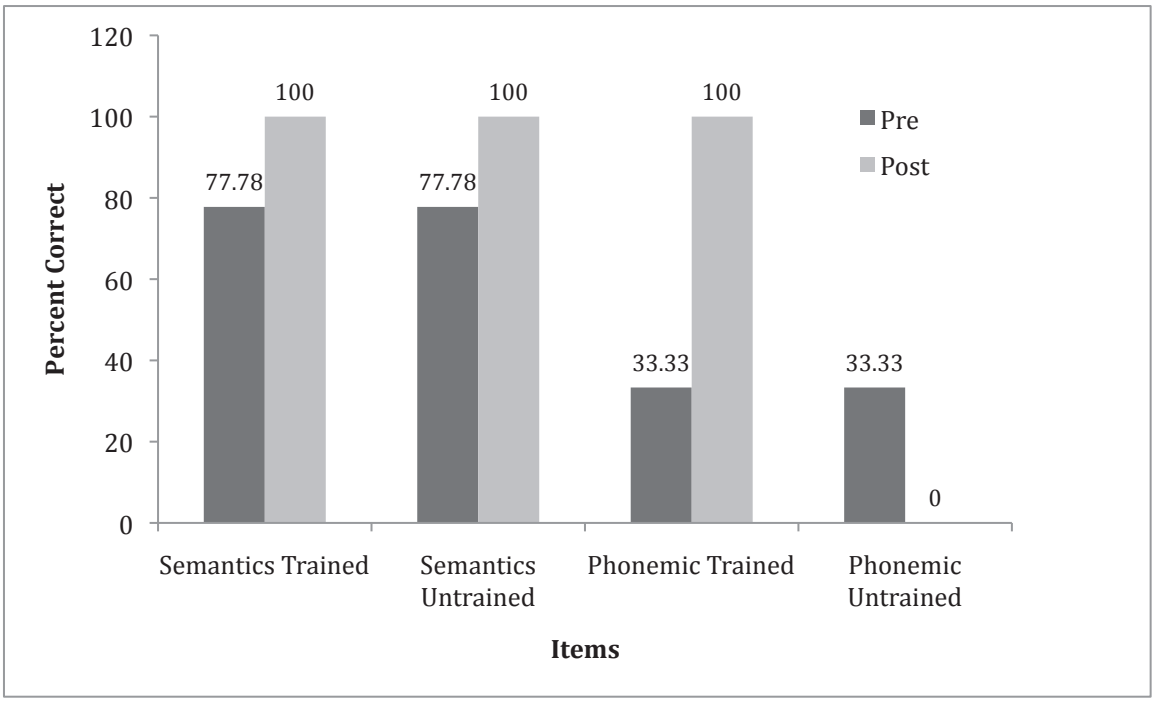


Figure 11: Student 3 Results of the Word Attribute Identification Task

Student 3's performance on the *word association task* was variable. At baseline, he responded with mostly syntagmatic-type answers. This was true for post-intervention performance, as well. A relatively substantial increase in paradigmatic responses was observed at post-testing, however, suggesting an increase either in understanding of the task or in lexical knowledge. Of note, Student 3 responded with syntagmatic or paradigmatic answers on the items that were explicitly taught as part of the intervention (e.g., garden, baby, zoo, surfer). Student 3 often repeated the target word first when listing associations. It is possible this is either a word processing strategy or he did not fully understand the task. Figure 12 is a summary of Student 3's performance on the *word association*

task. Figure 13 is a summary of the overall percentage of each category at pre and post. Although his rate of paradigmatic responses increased from 1 to 1.25, the actual percentage of these responses decreased. Further analysis shows that his total number of responses increased from 29 to 53, suggesting that the task may have become easier for him. However, repeated responses account for the majority of this increase. At the same time, his overall rate and percentage of syntagmatic and paradigmatic responses increased indicating some growth.

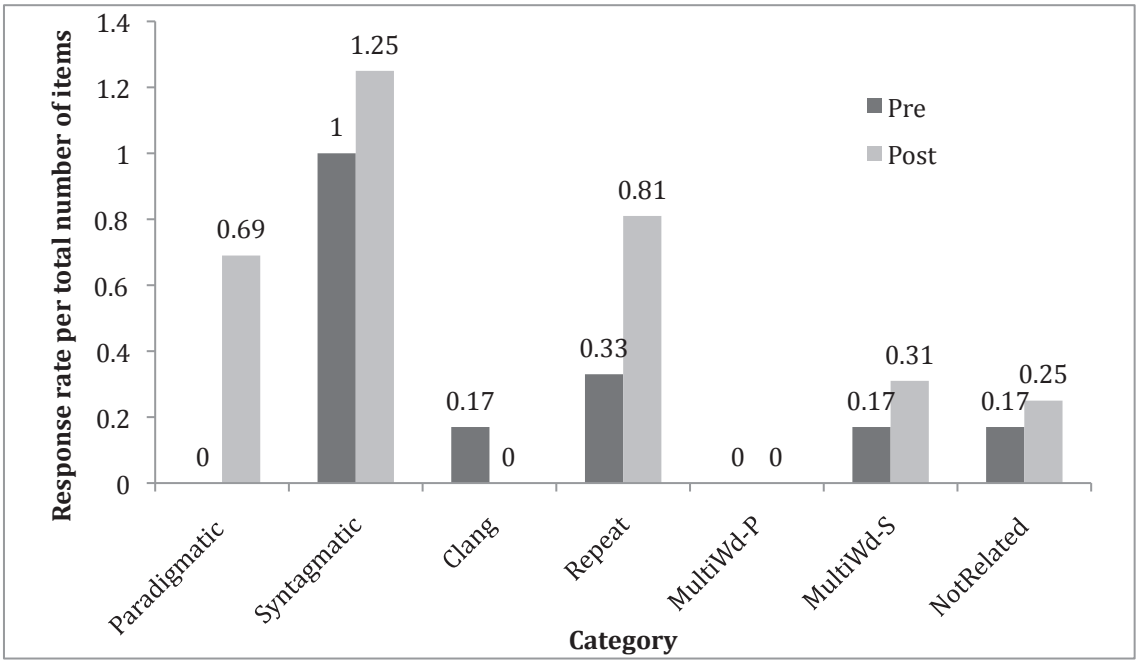


Figure 12: Student 3 Response Rate per Total Number of Items by Category

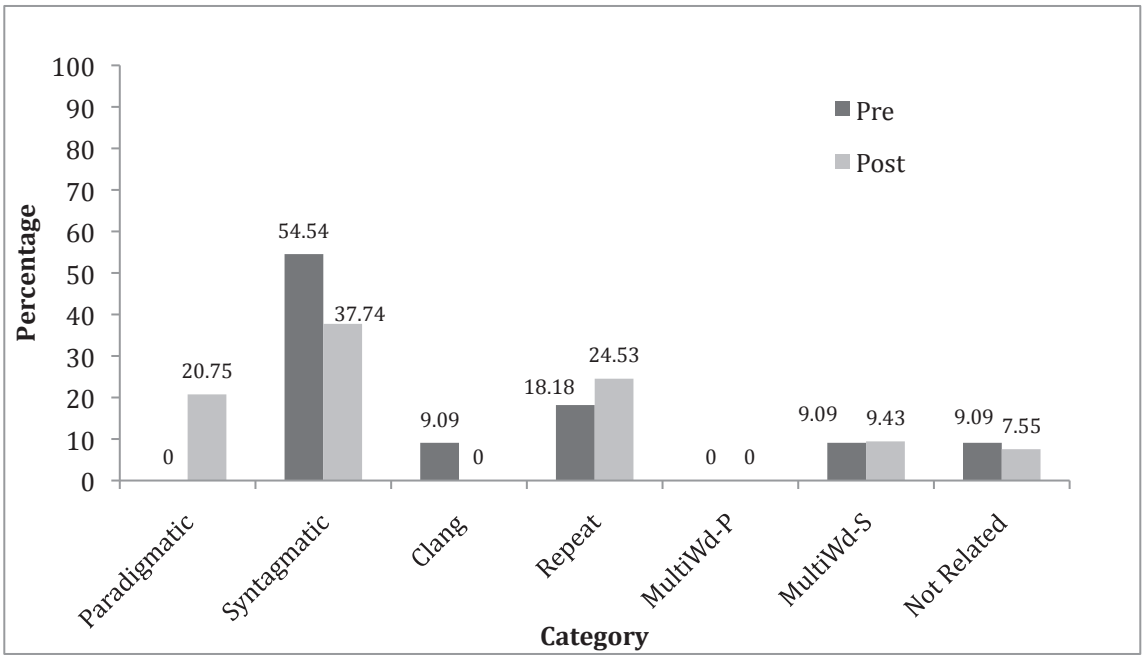


Figure 13: Student 3 Percentage of Each Category for All Responses

Student 3's performance on the narrative task was inconsistent. MLU decreased slightly from 4.61 to 4.38. While the number of different words increased from 42 to 49, TTR decreased somewhat from 0.54 to 0.45, suggesting no changes in the variety of his vocabulary.

Observations from intervention: Student 3 was usually eager to engage in the intervention. With relatively few prompts, he was able to answer most items that were related to rhyme awareness and syllable segmentation, which is consistent with his performance on the *PIPA*. More difficult skills, including sound isolation and segmentation, required maximum support and prompting. Performance on sound-letter awareness was inconsistent during intervention sessions.

Student 4

Student 4, a male, was 5 years, 0 months at the onset of the study. Student 4 was receiving special education services due to expressive, receptive, and pragmatic language difficulties as a result of developmental delay. A few phonological errors were also present. Services also addressed attention, memory, perception, and reasoning. Motor skills were also moderately low.

Student 4 was present for all large group and small group sessions. Overall performance on standardized measures decreased from pre- to post-intervention with the exception of one subtest on the *PIPA*. Student 4 received a raw score of 87 at baseline and a raw score of 82 following intervention. A decrease in performance on the *EVT* was also observed with an 11-point decrease (pre = 69, post = 58). Raw scores on the *CELF-P:2* Sentence Structure subtest also decreased from 16 to 12. With the exception of two subtests, Student 4 performed more poorly at post-intervention. Figure 14 shows raw scores for *PIPA* at pre- and post-intervention.

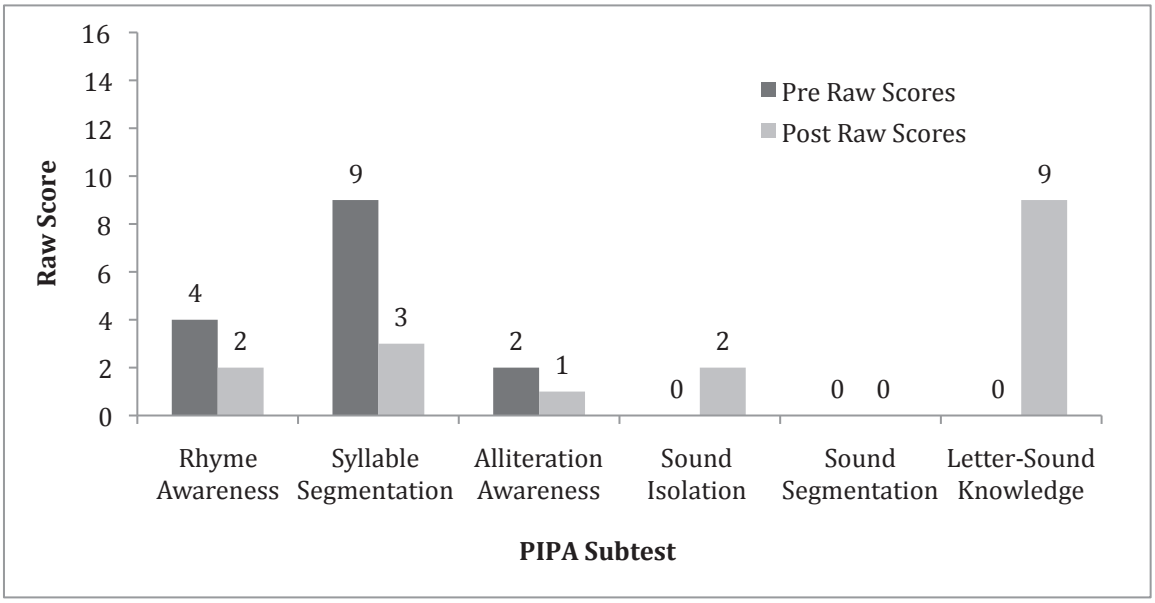


Figure 14: Student 4 Pre and Post Raw PIPA Scores

Outcomes on the *word attribute task* for Student 4 were mixed with fewer correct items on the trained semantic portion of the task after the intervention (77% to 66%). He answered 100% of the untrained semantic items at both pre- and post-intervention assessment. Sub-lexical items proved to be harder for Student 4 with a slight increase in accuracy from 33% to 50% on trained sub-lexical items and a consistent 50% correct performance score at both times for untrained sub-lexical items.

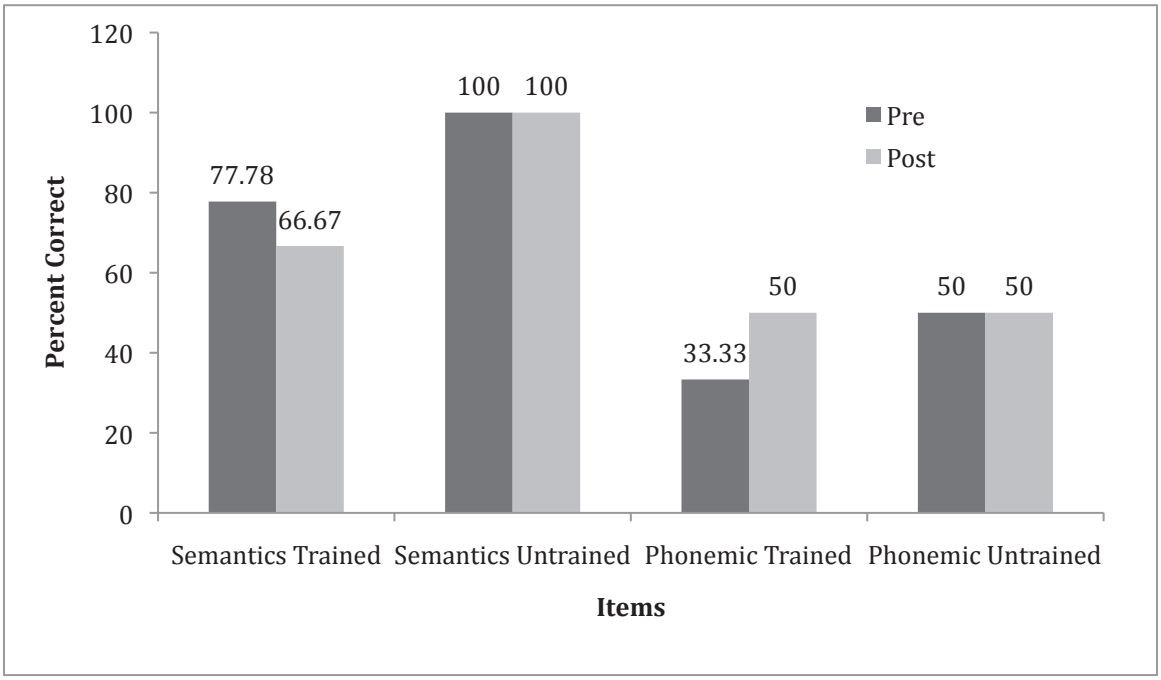


Figure 15: Student 4 Results of the Word Attribute Task

A dramatic difference was seen in post-intervention responses to the word association task for Student 4. At baseline, responses were primarily clang with few responses in the paradigmatic or syntagmatic categories. A change in answers from clang to syntagmatic at post-testing may suggest an increase in vocabulary knowledge. On trained items, Student 4 responded appropriately to all words, except for *surfer*, which he answered "people" and "kind of like a boat." While the

first response can be considered paradigmatic, the second response may reflect difficulty in recalling the word *surfboard*. Overall, Student 4 made substantial gains on this task showing more mature responses following intervention suggesting an increase in vocabulary depth. A summary of his performance can be found in Figure 16. The total number of responses increased from 12 to 29 from pre to post. Analysis of the categorical percentages showed that Student 4 responded with substantially more paradigmatic and syntagmatic answers at post-testing. Clang responses were reduced markedly from pre to post, as well. Figure 17 summarizes the percentages for each category at pre and post.

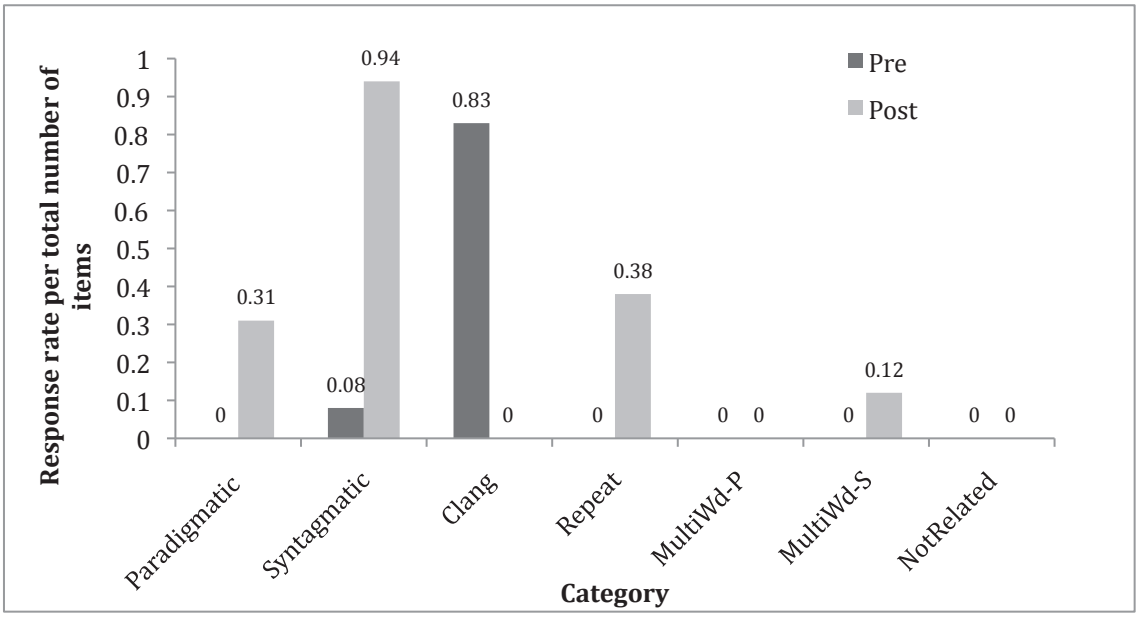


Figure 16: Student 4 Response Rate per Total Number of Items by Category

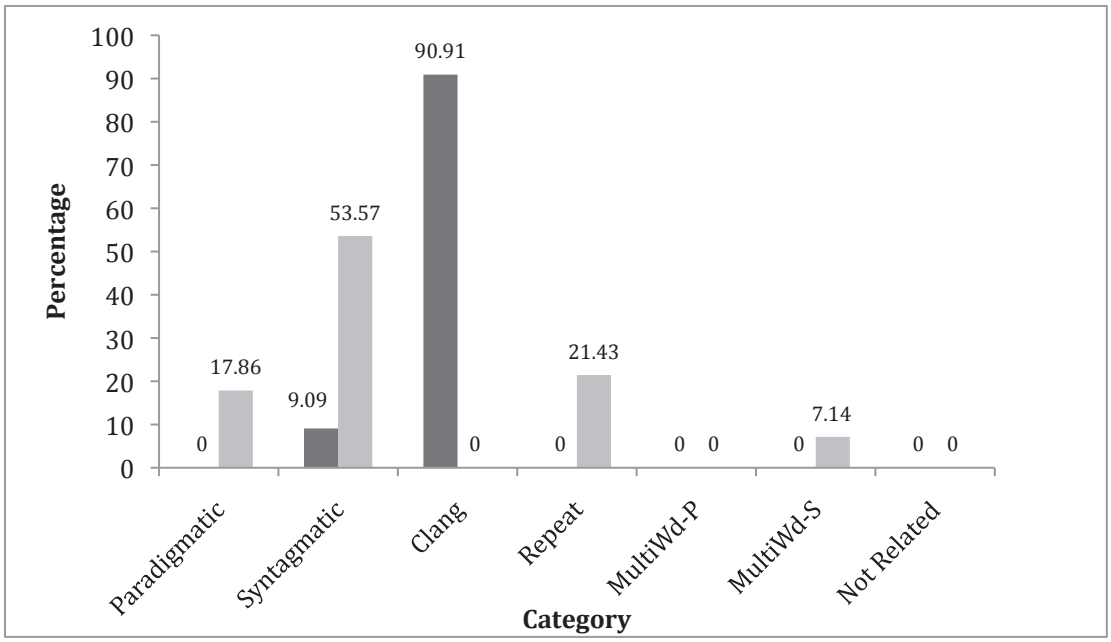


Figure 17: Student 4 Percentage of Each Category for All Responses

The greatest gains for this student were seen in the narrative task. His MLU increased from 3.56 to 5.80. Substantial gains were also seen in the NDW with 28 different words in his first narrative sample and 36 in his final sample. Type-token ratio decreased slightly from 0.55 to 0.47.

Observations from intervention: A number of factors prevented Student 4 from engaging fully in the intervention. During the sessions he was highly distracted and had a great deal of difficulty attending to the instruction. A teacher sat with him for most of the large group sessions to redirect and prompt him. Small sessions were less of a challenge initially, though as time went on, Student 4 needed a formal review of the "rules" when joining the small group and frequent positive reinforcement. When Student 4 was fully engaged he was able to answer most of the questions related to phonological awareness including syllable segmentation, rhyme awareness, and letter-sound knowledge.

Student 5

Student 5, also male, was 5 years, 0 months at the start of the study. He was receiving speech and language services to address a moderate phonological disorder. He also received occupational and physical therapy services. Language and cognitive skills were in the average range.

Student 5 was present for all of the large and small intervention sessions. Performance on measures of vocabulary (*PPVT-4* pre- and post-: 104, 105; EVT pre- and post: 78, 80) and listening comprehension (*CELF-P:2* pre- and post-: 18, 18) remained the same at pre- and post-intervention. Student 5 made 2-3-point gains on all subtests of the *PIPA*, with the exception of the Letter-Sound Knowledge subtest where a 6-point gain was made following the intervention. Figure 18 shows Student 4's raw scores on the *PIPA* at pre- and post-intervention.

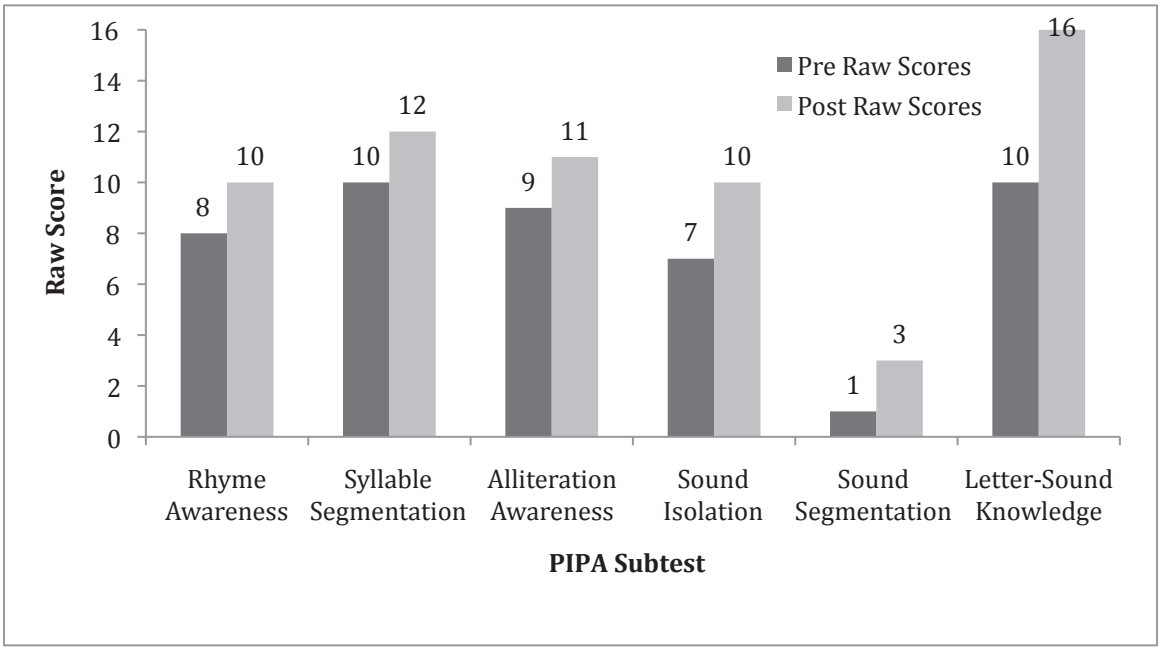


Figure 18: Student 5 Pre and Post Raw PIPA Scores

Student 5 had a relatively high percentage correct at baseline for the *word attribute task* in all categories, with the exception of the trained sub-lexical items. At pre-intervention, Student 5 answered 77% of the semantic items pertaining to trained words and made a slight gain with 88% correct on the same words at the end of the study. For untrained semantic items, Student 5 had an increase from 87% correct to 100% at post-intervention. A large increase was seen on trained sub-lexical items with a baseline of 50% accuracy and a final 100% accuracy. For untrained sub-lexical items, Student 5 remained at 100% accuracy from pre- to post-intervention.

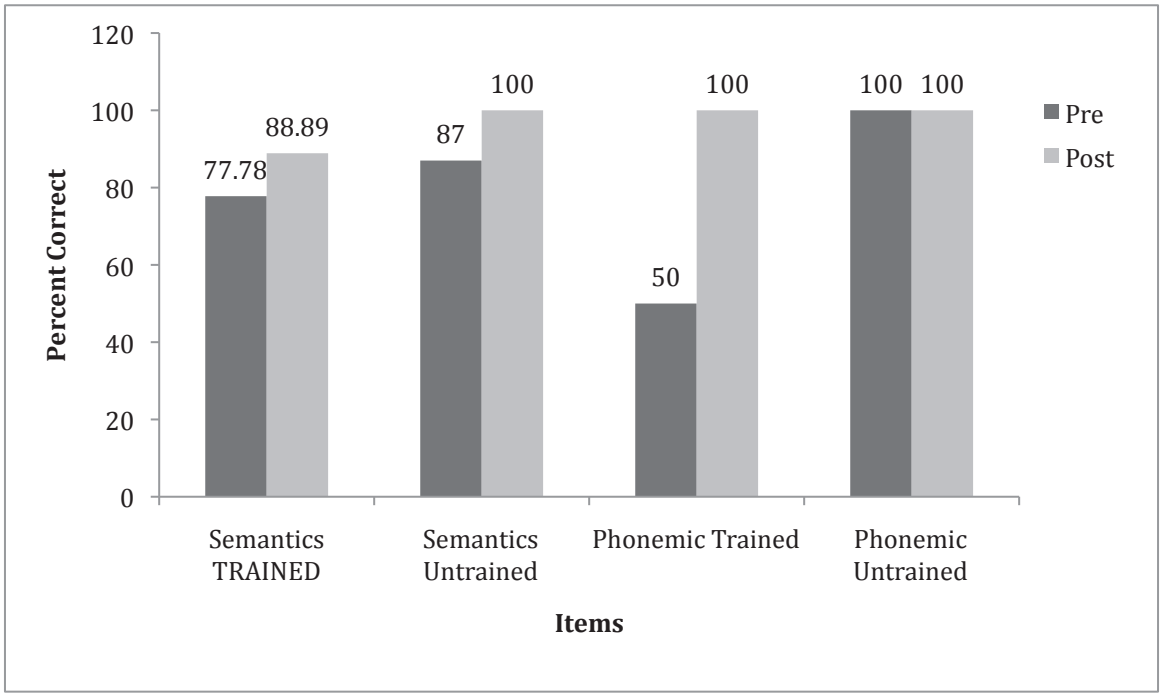


Figure 19: Student 5 Results of the Word Attribute Identification Task

Student 5 remained relatively constant for his performance on the *word association task*. The majority of his responses were of the syntagmatic type, which was also true for his post-intervention responses. There was a decrease of in his

paradigmatic responses from a rate of 0.58 prior to the intervention to 0.13 following the intervention. On average, Student 5 produced 4.75 responses per question at pre-testing and 4.31 responses per question at post-testing. Of the 4 items in the task that were also target words in the intervention, Student 5 mentioned a few word associations mentioned during the intervention (e.g., "seaweed" for surfer; "bottle" for baby). Figure 20 is a summary of Student 5's performance on the *word association task*. Categorical percentages at pre and post, as summarized in Figure 21 reflect similar results as the response rate, as shown in Figure 20. This suggests both his rate of syntagmatic responses slightly increased, and his total number of syntagmatic responses also increased relative to the total number of answers produced. Overall, Student 5 produced similar answers before and after the intervention.

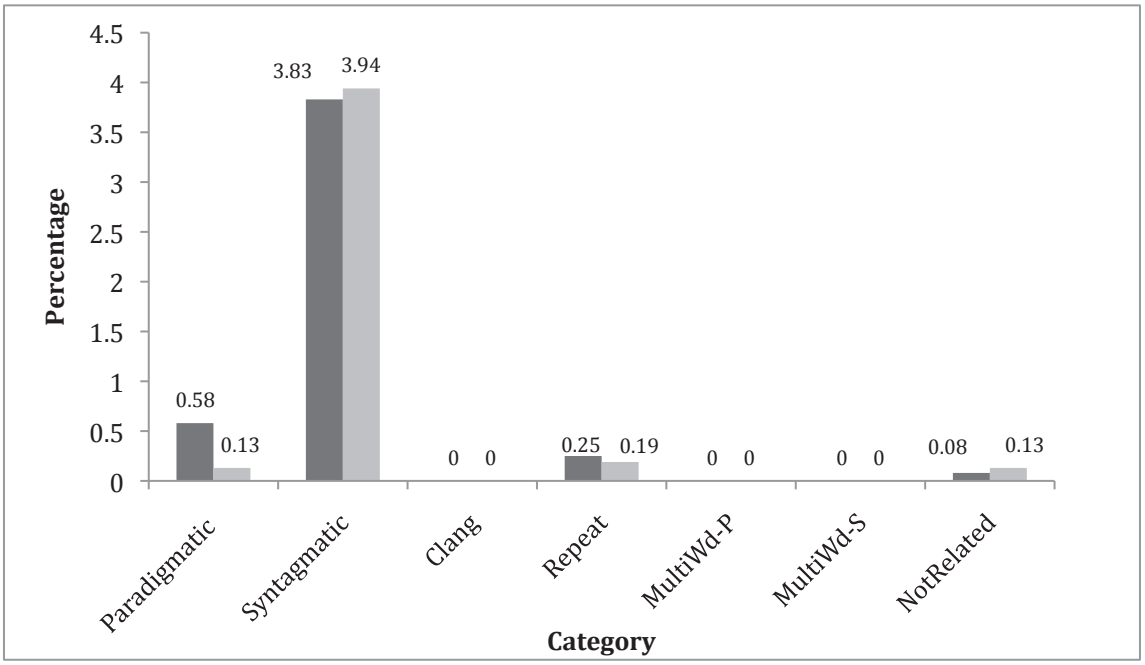


Figure 20: Student 5 Response Rate per Total Number of Items by Category

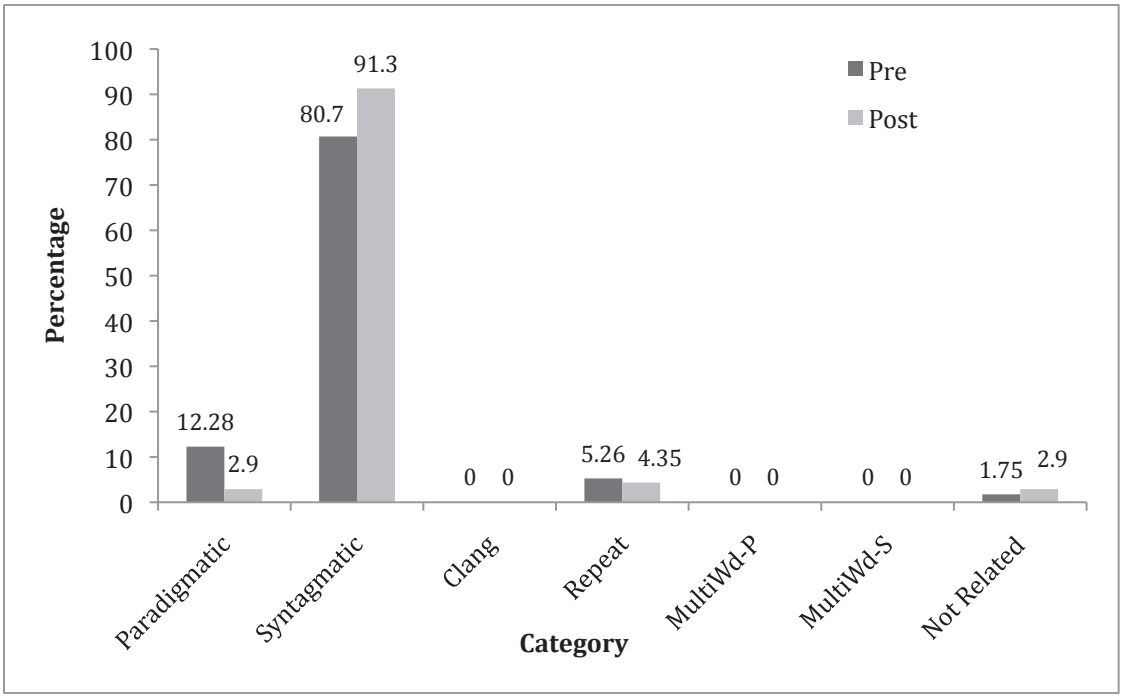


Figure 21: Student 5 Percentage of Each Category for All Responses

Substantial gains were observed from pre- to post-intervention on two of the three measures on the narrative task with an increase from 38 different words to 81 at post-intervention. A large gain was also seen on measure of mean length of utterance with and increase from 6.77 to 9.0. Type-token ratio decreased from 0.46 to 0.34.

Observations from intervention: Student 5 was one of the strongest students, not only among the other students with communication disorders, but among his class. At times, his articulation errors prohibited him from producing the correct response; however, he was able to demonstrate his knowledge through non-verbal responses (e.g., pointing, matching). He made the greatest gains among those students with communication disorders, especially in the areas of letter-sound

knowledge, lexical and sublexical knowledge, MLU and NDW on the narrative task. A number of strengths may have contributed to Student 5's progress, including sustained attention for large and small group instruction, listening comprehension, and high average receptive vocabulary skills.

CHAPTER 6

DISCUSSION

Group Effects

The purpose of this study was to examine the effectiveness of a classroom-based pre-literacy intervention for students with and without communication disorders. Four research questions were addressed:

1) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children in an integrated classroom?

2) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children with communication disorders (autism, speech sound disorder, specific language impairment, etc.)?

3) Are there generalized effects of a classroom-based hybrid pre-literacy instruction and intervention program on oral narrative production and listening comprehension? Note: These skills are not explicitly targeted but are integrated into the intervention as a result of the intervention format.

4) What changes can be measured in lexical-semantic and sub-lexical storage and access pre- versus post hybrid intervention?

Outcomes of this study support the notion that pre-literacy training for preschoolers, especially those at risk for developing reading disorders, is useful, yet challenging when carried out in the classroom. After a 10-week classroom-based

intervention, statistically significant differences were not found between the experimental group and the control group on standardized measures of receptive and expressive vocabulary, listening comprehension, and phonological awareness. Therefore, maturation cannot be ruled out as a possible explanation for increases in performance on these measures for the experimental group. The null hypotheses pertaining to standardized measures of vocabulary, phonological awareness and listening comprehension cannot be rejected.

Statistically significant differences were found between the two groups on one non-standardized task with the experimental group performing better on items in the *word attribute task* that assessed lexical-semantic and sub-lexical knowledge of trained words. That is, students who were explicitly taught the lexical-semantic and sub-lexical features of target words during the intervention answered more questions about these words correctly than those students in the control group. Therefore, the null hypotheses pertaining to lexical-semantic knowledge and sub-lexical hypotheses can be rejected. It is hypothesized that these results are a direct result of the explicit teaching of these words during intervention. Of note, while the students' scores did not improve on measures of *vocabulary expansion* (i.e., *PPVT-4, EVT*), they did improve performance on items that measured vocabulary *depth*, as demonstrated on the *word attribute task*. Students in the experimental group performed better on trained items; however, there were no differences between the groups on untrained items (for both lexical-semantic and sub-lexical). This suggests that knowledge of word attributes did not generalize to untrained items. These

results may indicate that explicit teaching of semantic features is a valuable method for the preschool classroom, especially for those with communication disorders.

The purpose of the *word association task* was to measure the quality of responses generated by each student. For instance, if the student generated a single-word response that shared a paradigmatic or syntagmatic relationship with the target word, these responses were considered to be more mature, demonstrating a more intricate knowledge of the vocabulary word. However, if the student responded with a multi-word utterance, or a rhyming word, or repeated the target word, it could be assumed that the child either did not understand the task or the child may have difficulty accessing related words. Of the single word responses, the majority of the words generated by both groups were of the syntagmatic category. This was the predicted outcome given the theory of the "syntagmatic-paradigmatic shift", a developmental phenomenon which suggests that children 5 years and under typically respond with answers that fall in the syntactic category. Around the age of 9, children tend shift to answers that are paradigmatic, which suggests a more mature semantic system (Lippman, 1971). The intervention included explicit exercises in word associations each week. Thus, it was predicted that students in the experimental group would perform better on this task compared to their peers in the control. However, the performances of the students in the experimental group appeared to be just as variable as those of the control group with no statistical differences from pre- to post intervention. Several students increased their overall amounts of responses, as well as the quality of their responses. These results provide some evidence that the explicit instruction of

word associations during the intervention may have increased lexical-semantic knowledge.

There were no statistically significant differences between the two groups on any language measures used to analyze the oral narratives including Mean Length of Utterance (MLU), Number of Different Words (NDW), and Type-Token Ratio (TTR). Both groups made substantial gains on NDW, but the differences were not significant between groups. Thus, the outcomes are both likely due to maturation. There are a number of possible reasons why the experimental group did not perform significantly better on these measures. The narratives were not explicitly taught as part of the intervention; rather they were an imbedded tool used to create context for the vocabulary and the phonological awareness lessons. Students were not asked to *use* the vocabulary, only to learn the features. It can be assumed that the general vocabulary lessons in this intervention did not generalize to the students' use of vocabulary in a narrative setting, only their understanding of features. This may be a valuable consideration for those who are selecting or designing appropriate interventions. That is to say that an intervention designed to only increase the depth of vocabulary knowledge may not increase a student's use of vocabulary, and vice versa.

Individuals with Communication Disorders

Gains were made on a number of measures for students with communication disorders; however, these gains were inconsistent within this group. The student with a mixed language and phonological disorder (Student 3) and those with language disorders (Student 1 and 4) appeared to do more poorly on measures of

phonological awareness skills that required sound isolation and segmentation than the one child with a phonological disorder (Student 5). Phoneme segmentation is considered one of the more advanced skills that are directly related to reading acquisition and has been documented as one of the more difficult tasks for children with language impairments (Webster & Plante, 1992).

A number of factors also contribute to these inconsistent outcomes, including the level of engagement and behavioral difficulties among these five students. One major challenge of a classroom-based intervention is engagement for a wide variety of students. More on this challenge will be discussed in the limitations section.

The one child diagnosed with autism spectrum disorder in the experimental group was unable to participate for the majority of the intervention sessions due to his difficulty attending. While the sessions were highly repetitive in nature, the pace and the language used were likely a barrier to this student's learning. Most of the sessions required a 1:1 paraprofessional and moderate to maximum prompting for him to answer questions related to the material. This was also the challenge for his pre- and post-testing. These problems are not unlike the challenges found in the literature when working with young individuals with autism spectrum disorder in the general education setting (Simpson, de Boer-Ott, Smith-Myles, 2003).

Clinical Implications

Teachers and speech-language pathologists face a number of different challenges when working with children who present with various language and learning skills within the same environment. These challenges are further complicated by recent mandates such as Response to Intervention (RTI) and the

Common Core State Standards. While caseloads continue to rise for school SLPs and less time is spent in the treatment room for each individual student, the need for effective classroom-based instruction is critical.

Literature over the last few decades has made researchers and educators acutely aware of the need for explicit teaching of phonological awareness skills to young students. The same is true when understanding the importance of vocabulary development for reading. While there are a number of limitations, the intervention design presented in the current study has potential to serve as a framework for future instruction due to the hybrid approach and connective material. The instructional methods closely followed Ukrainetz' (2006, as cited in Munro et al. 2008) framework, which promotes four concepts for instruction.

The first of Ukrainetz' concepts for instruction is repeated opportunities. The instruction in the current study addressed repeated opportunities both within each session and across the sessions, with one session serving as a pre-teaching of the material in the large group and the small group session serving as the "solidifying" opportunity the next day.

The second concept within Ukrainetz's framework is intensity. Among the challenges of working within a preschool classroom is the overall lack of time given the half-day, 4-day schedule, which restricted the frequency of the formal intervention sessions that could take place. However, there is potential to increase the intensity given the combination of the formal sessions and informal interactions with the classroom teacher between sessions. Here, the teacher could engage

students in the same concepts in their daily routine and align more content with the "sound of the week" or the vocabulary words addressed in the formal sessions.

The third concept within Ukrainetz's framework is systematic support. That is, prompts and scaffolding should be systematic and predictable. These elements were found among the current intervention, though scaffolding could be improved not only in the gross presentation of skills, but in the manner in which questions are presented within the instruction. For instance, it is likely that the steps between each skill presented within the ten weeks were too large, thus making the intervention too challenging for those with learning disabilities. They may not have been able to grasp the concepts well enough in order to form a solid foundation upon which they could build a new understanding of phonological awareness. Likewise, it is possible that the steps from question to question within each session were too wide or that the questions did not provide enough context for students.

The final concept within the Ukrainetz framework is explicit skill focus. The intervention presented in the current study was designed to address skills explicitly, breaking larger concepts of phonological awareness into isolated skill sets that related to meaningful content (i.e., a specific story). These skills were repeated in isolation and some skills, including alliteration awareness and rhyme, were addressed throughout the ten weeks. Explicit teaching could be improved with increased opportunities for practice and various means to demonstrate the skills. For instance, when practicing syllable segmentation, students could segment syllables by tapping or clapping them with picture cues, physically step into squares taped along the floor to distinguish the syllables, or move large blocks.

As mentioned above, a number of skills addressed in this intervention are outlined in the Common Core State Standards. While the skills are designated for Kindergarten, it is critical that students who are at risk of developing reading disorders, including those with communication disorders, are exposed to such skills as early as possible. The intervention proposed in this study offers a systematic and appropriately leveled method of instruction that may provide a valuable stepping-stone for future instruction at the preschool level.

Likewise, effective classroom-based interventions are ideal for both for SLP-collaboration and Tier 1 of the RTI which states that "all students in Tier 1 receive high-quality, scientifically based instruction, differentiated to meet their needs, and are screened on a periodic basis to identify struggling learners who need additional support" (National Center for Learning Disabilities, 2011). Such instruction of PA and vocabulary at the pre-school level could aid in early identification of those students who may be at risk and. at the same time, provide structured activities that expose them to skills they are expected to have in kindergarten.

While several students with communication disorders in this study made progress following the intervention, the changes were minimal overall. This study supports the notion that students with such difficulties need explicit instruction of phonological awareness as recommended in previous literature and that large group instruction may not be sufficient (Gillon, 2000; van Kleeck, Gillam, McFadden, 1998).

Limitations

There are several limitations to this study that may have prevented identifying more statistically significant differences. The small sample size is one overt limitation, with only 13 students in each group. A small sample for this study presents an issue of power. That is, if statistically significant differences were present, a small *n* may limit the detection thereof.

The standardized tests chosen for this study present two additional possible limitations. First, standardized tests are not sensitive enough to detect changes in a student over the course of 10 weeks. Second, there are several confounding variables within the tests themselves. For instance, the *PIPA* requires a child to understand the concept of belonging when asking a student to identify a word that "does not belong." Similarly, the *PIPA* does not provide enough examples and practice items, with wide contrasts causing confusion among students when learning the task.

With regard to the intervention, there were also several limitations. Despite the intentions and flexibility of the staff, some students had to miss the intervention due to conflicting therapy times outside the classroom. Space was also an issue for both the intervention and testing. Testing often took place in a quiet, yet distracting room (e.g., the music room) with various new items the students had never seen before. Space within the classroom also became a challenge for small group intervention. For these groups, the students met the instructor in the loft situated above the rest of classroom. While this space provided adequate distance from the other students, the clear acrylic walls allowed students to see the other activities in

the classroom, which often caused distractions. Although these three limitations may have had negative effects on the testing and intervention, they are very representative of the challenges many educators face in the classroom.

Lastly, the intervention could have aligned better with the phonological awareness activities the classroom teacher was providing to the students. Students were usually learning a different sound and letter from their classroom teacher than from the researcher, which may have caused confusion. Alignment may have provided the extra support for those students needing consistent exposure.

Conclusions

The results of this study highlight the challenges and the opportunities educators and SLPs face in inclusive classrooms. Several decades of research and recent changes in educational policy support explicit teaching of pre-literacy skills, including phonological awareness and vocabulary, as early as possible. As suggested by these results, classroom-based instruction can be successful for some students with communication disorders, especially given the limited time students spend in the therapy room. This study also tells a cautionary tale—one that suggests that educators and SLPs carefully examine assessment materials and consider the way in which they monitor progress.

This study showed dramatically different results compared to the Munro, Lee, Baker (2008) study which demonstrated statistically significant results on all (comparable) measures of vocabulary, listening comprehension, oral narratives, and phonological awareness. As mentioned earlier, one major difference in this study is the addition of a control group. In isolation, the experimental group in this study

showed significant differences from pre- to post-testing. However, the control group also showed significant differences, suggesting that the gains observed in the experimental group cannot be a result of the intervention alone and that maturation is likely a contributing variable. Because there was no control group in that study, it is not possible to determine whether the progress demonstrated by the participants in the Munro et al. (2008) study was due to maturation. Despite these issues, the intervention proposed in this study contributes to the current literature by adding additional methods of explicit instruction for vocabulary, connective materials (i.e., consistent vocabulary in all materials), and considerations and cautions for classroom-based interventions.

Future Research

Although the design of this intervention has potential, one major element left out of this intervention was engagement. Future research will consider the framework of Universal Design for Learning (Rose & Dolan, 2000) to reach the students more effectively. There are three guidelines under this framework: 1) provide multiple means of representation, 2) provide multiple means of expression, 3) provide multiple means of engagement. Within each guideline, there are leveled principles to address accessibility, guided practice, and higher-level thinking. Using these elements of UDL, there is a great deal of potential to increase the level of engagement, representation, and expression for the current intervention. For instance, one possible way to increase engagement would to incorporate a SMART board. Such a tool would allow students to manipulate the material in a less cumbersome fashion and potentially heighten attention. A SMART board could also

increase the use of different features to allow for multiples ways to represent the information including text, graphics, and film. For expression, a SMART board could allow students to draw pictures, circle the answer, or respond as they did in this intervention by pointing or verbalizing.

APPENDIX A

WORD ATTRIBUTE TASK

Vocabulary Task 1: Word Attribute ID Task **ID#_____**

Names all 36 pictures: Y / N

SET A		Question	Answer	Response	F	A S	AT	R	AL
Function	1A	Which one do we sit at?	table						
Association	2A	Which one goes with bottle?	baby						
Attribute	3A	Which one is crunchy?	apple						
Rhyme	4A	Which one rhymes with rice?	ice						
Alliteration	5A	Which one starts with the sound /z/?	zoo						
SET B					F	AS	AT	R	AL
Alliteration	5B	Which one starts with the sound /l/?	lion						
Function	1B	Which one do we play with?	yo-yo						
Attribute	3B	Which one is wet?	rain						
Rhyme	4B	Which one rhymes with ring?	king						
Association	2B	Which one goes with farm?	pig						
SET C					F	AS	AT	R	AL
Rhyme	4C	Which one rhymes with pass?	grass						
Attribute	3C	Which one has fins?	fish						
Alliteration	5C	Which one starts with /m/?	monkey						
Function	1C	Which one tells time?	watch						
Association	2C	Which one goes with birthday?	cake						
SET D					F	AS	AT	R	AL
Association	2D	Which one goes with night?	moon						
Rhyme	4D	Which one rhymes with leg?	egg						
Alliteration	5D	Which one starts with /b/?	book						
Attribute	3D	Which one hops?	rabbit						
Function	1D	Which one is a home?	nest						
SET E					F	AS	AT	R	AL
Attribute	3E	Which one is cold?	snow						
Alliteration	5E	Which one starts with the sound /p/?	playground						
Rhyme	4E	Which one rhymes with log?	frog						
Function	1E	Which one do we ride?	horse						
Association	2E	Which one goes with ocean?	octopus						
SET F					F	AS	AT	R	AL
Function	1F	Which one gives us food?	garden						
Association	2F	Which one goes with winter?	hat						
Rhyme	4F	Which one rhymes with wizard?	lizard						
Attribute	3F	Which one is bouncy?	ball						
Alliteration	5F	Which one starts with the sound /d/?	dog						
				Totals					

APPENDIX B

ITEMS FOR WORD ASSOCIATION TASK

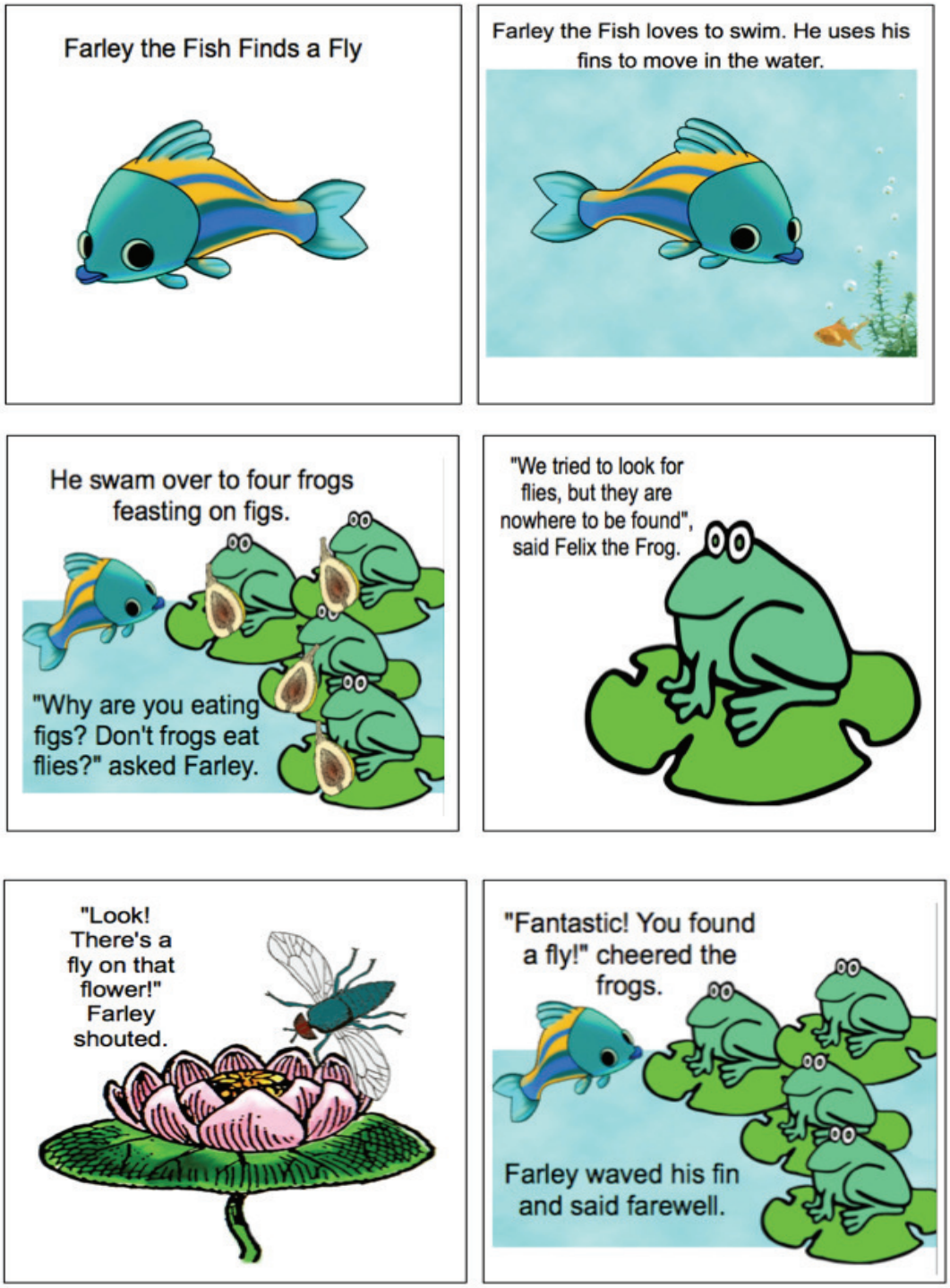
1. **Ocean**
2. **Teacher**
3. **Bird**
4. **Car**
5. **Cat**
6. **Candy**
7. **Big**
8. **Sun**
9. **Paint**
10. **Cold**
11. **Cow**
12. **Tree**

Additional words for post-test:

1. **Garden**
2. **Baby**
3. **Zoo**
4. **Surfer**

APPENDIX C

SAMPLE STORBOOK



APPENDIX D

SAMPLE LESSON PLAN

Week 6

/f/

Introduce sound and letter:

This is the letter… That's right, the letter 'f'
The letter 'f' is made with your bottom lip and your top teeth (as if you were biting gently on your bottom lip like this: "ffff")

There are many words that start with the sound /f/,
like fish, fig, frog, fin.

We're going to read a story that has many words that start with the sound /f/. I want you to listen to see if you can hear the words.

While reading the book:

Can you hear which words start with the sound /f/?
That's right….

Lesson:

Now, let's see if we can listen for the words that start with the sound /f/:

brush	**frog**	cherries
fish	pepper	drum

Great. Now let's listen for the words that do NOT start with the sound /l/:

fan	fly	**truck**
camel	flower	fig

Vocabulary Game: Fish

Who was the story about?
Yes, that's right, a fish.

Let's talk about the word FISH.

1—ATTRIBUTE

In the first corner, we're going to describe the fish.

What does the fish look like?
It's small. It does not have legs or arms.

What are the parts of a fish?
Tail, fins, head, body

2—FUNCTION/WHAT DOES IT DO? WHERE CAN YOU FIND IT?

In this corner we are going to talk about where we find fish
Water (ocean, lake, pond, river)

What do fish do?
Swim

3—ASSOCIATIONS

In this corner, we are going to talk about things that go with fish. Or I could say things I think about when I think of the word fish.

What goes with lizard?
Fish tank, fins, fishing pole, water

4—RHYME

In this corner we're going to talk about things that rhyme with fish:

Dish
Wish

Let's say them together.

Can you think of any others? They can be silly words, too.

Let's blending some sounds to make a word. The words will be from the book:

Fish
Fin
Fig

What letter is this again? And what sound does it make?

APPENDIX E

IRB FORMS

University of Massachusetts Amherst
School of Public Health and Health Sciences
Human Subjects Review Committee
(SPHHS-HSRC)

DATE: 10-19-11

TO: Alyssa Currier, Mary Andrianopoulos, Shelley Velleman

FROM: Karen Helfer, Ph.D, Chair, SPHHS-HSRC

SUBJECT: The following action resulted from human subjects review of your prpposal entitled: "Pre-literacy intervention: Building foundations in the classroom for children with and without communication disorders"

SPHHS-HSRC file #: 12-9

- ✓ **1a**. Your has been APPROVED by the ***SPHHS-HSRC*** after expedited review under 45CFR46.110(b).
- ☐ **1b.** Administratively approved by the chair of ***SPHHS-HSRC*** for continuing research of previously approved protocol.
- ☐ **2a.** The ***SPHHS-HSRC*** requests the following information from the investigator before a final decision is made:
- ☐ **2b.** The ***SPHHS-HSRC*** has ***NOT APPROVED*** the above proposal for the following reasons:
- ☐ **3.** Your proposal was determined ***EXEMPT*** under 45CFR46.101 by the Chair of the ***SPHHS-HSRC***.

Karen Helfer, Ph.D.
Chair, SPHHS-HSRC

APPENDIX F

CAREGIVER CONSENT FORMS

The University of Massachusetts Amherst
Institutional Review Board

Completeness of Informed Consent Form

Study Title: **Pre-literacy intervention: Building foundations in the classroom for children with and without communication disorders**

Principal Investigator Statement:

My signature below indicates that I have proofread and/or edited the informed consent form for the above mentioned study and that it contains the essential elements required for informed consent.

Alyssa R. Currier
Student Researcher's Name (Print or Type)

Student Researcher's Signature Date

Mary Andrianopoulos

Principal Investigator's Name (Print or Type) Date

Principal Investigator's Signature

Shelley L. Velleman

Principal Investigator's Name (Print or Type)

Principal Investigator's Signature Date

RESEARCH INFORMED CONSENT FORM

Subject: Pre-literacy instruction in preschool classrooms

Principal
Investigators: Alyssa R. Currier, Mary Andrianopoulos, Shelley L. Velleman

Study
Sponsor: _N/A_____

Title of Project: **Pre-literacy intervention: Building foundations in the classroom for children with and without communication disorders**

By signing this consent form you, _____, for yourself or on behalf of your ward, _____, indicate that you willingly agree to participate in this project. The essence of this project is as follows:

PURPOSE OF RESEARCH:

Early literacy skills are considered an important part of children's development. Some of these skills include rhyming, identifying the first sound of words, and knowing vocabulary words. Children with communication disorders are often at risk of reading difficulties. This study is will look at the effects of a 12-week program in a classroom setting for preschool students with and without communication disorders. The program will focus on early literacy skills in the form of stories and games. The goal of this study is to find effective classroom-based programs for students with and without communication disorders so that all students may have more time in their classroom with their peers.

PROCEDURES:

There will be two classrooms in the study. One classroom will receive the program and one classroom will not. All children (in both classrooms) will be given a set of tests at the beginning and end of the program. These tests measure listening comprehension, story telling, vocabulary, and rhyming and sound identification. If your child is in the classroom that receives the intervention program, they will be given a group lesson with one story and a game one day a week for 12 weeks. They will also participate in a small group game one day a week for 12 weeks. Children who are in the other classroom will receive the regular curriculum provided by the school.

RISKS AND DISCOMFORTS:

There are no known risks if your child participates in this study. All information gathered during this study is for the purposes of the investigation; some of the data may also be used for future studies. Your child's identity will remain anonymous at all times; we will use a code instead of his or her name. All data will be kept in a locked room in locked filing cabinets to which only the principal investigators have access. Your child's privacy and confidentiality will be carefully maintained during all aspects of this study. No personal information about your child will be shared with anyone except the principal investigators.

BENEFITS:

There are possible benefits of this research for all children involved in this study. All children will receive comprehensive testing of early literacy skills. This information may be helpful in order to determine if your child may need more support when learning to read and write. Information about your child's tests results will be provided to you at no cost.

The information gathered in this study will also help other preschool children nationwide who may be at risk of reading difficulties. It will help us to understand how we can better teach early literacy skills to preschool children with and without communication disorders.

COSTS & COMPENSATION:

Participants will receive a $10 gift card to a local bookstore in South Hadley. In addition, the results of your child's testing will be provided to you at no cost. This may help your child's teachers better understand your child's pre-literacy skills.

ALTERNATIVES TO PARTICIPATION:

You may refuse to allow your child to participate in this study. You are free to discontinue your child's participation in this study at any time, for any reason, without penalty or negative consequences.

SUBJECT ENROLLMENT/LENGTH OF STUDY:

We estimate that your child will participate in 60 minutes of testing (2 sessions of 30 minutes each). These sessions should take place within a 2-month time period. Those students participating in the program will receive 45 minutes of the program one day/week in a large group, and 15 minutes of the program in a small group one day/week for 12 weeks. Your child will not have to leave their

classroom for the intervention program. All program sessions will take place in their classroom with their peers.

CONFIDENTIALITY:

Your child's research records will be confidential and private. His/her identity and all personal information will be kept confidential except where it may be required under federal regulations. His/her research data will be filed in locked file cabinets by code number and only the principal investigators will have access to these files at any time. If the results of this study are written in a scientific journal or presented at a scientific meeting neither his/her name nor any other personal information will be used.

VOLUNTARY PARTICIPATION:

Your child is under no obligation to participate in this project. You may withdraw your child's participation at any time with no negative consequences for you or your child.

REQUEST FOR ADDITIONAL INFORMATION:

This study has been approved by the Institutional Review Board at the University of Massachusetts-Amherst. You may ask more questions about the study at any time. If you have any questions or concerns about your child being in this study you should contact me, the student researcher, Alyssa Currier (acurrier@comdis.umass.edu; 603-285-1729) or my faculty supervisor, Mary Andrianopoulos (mva@comdis.umass.edu; 413-545-0803). A copy of this consent form will be provided to you for careful re-reading.

INJURY STATEMENT: The University of Massachusetts does not have a program for compensating subjects for injury or complications related to human subjects research. It should be understood that in the very unlikely event of injury resulting directly from participation in this study, if such injury were reported promptly to one of the investigators, they would assist your child in receiving prompt treatment at an appropriate location. It also should be understood that by your agreement to allow your child to participate in this study, you are not waiving any of your legal rights.

RECORDED AND ARCHIVED INFORMATION

Testing sessions will be video recorded on a DVD. These recordings will be stored in a locked filing cabinet by code number and only the principal investigators will have access to these files at any time. With consent, recordings will be stored securely for as long as they are useful for research about the pre-literacy intervention program and communication disorders. Research in this area is somewhat limited; therefore, archiving these recordings will also contribute to future research.

SUBJECT STATEMENT OF VOLUNTARY CONSENT

I confirm that _____ has explained to me the purpose of the research, the study procedures that my child will undergo, and the possible risks and benefits that he or she may experience. I have read and I understand this consent form. Therefore, I agree to give my consent for my child to participate as a subject in this research project.

_____ _____

Participant (or Guardian or Legal Representative) Signature — Date

_____

Participant (or Guardian or Legal Representative) Name, Printed

_____ _____

Signature of Witness to Signature — Date

_____

Witness Name, Printed

STUDY REPRESENTATIVE STATEMENT:

I have explained the purpose of the research, the study procedures, the possible risks and discomforts, the possible benefits, and have answered any questions to the best of my ability.

_____ _____

Study Representative Name (Print or Type) Date

_____ _____

Signature Date

Information and Results

I ___ do / ___ do not give permission for the researchers (Alyssa Currier and her faculty advisors) to retain my contact information in a secure location to be used for follow-up studies. I understand that this information will not be shared with anyone else and will be destroyed immediately if I so request at any time.

I ___ do / ___ do not give permission for the researchers (Alyssa Currier and her faculty advisors) to retain my child's test results for as long as they are useful for research about pre-literacy intervention and communication disorders.

Archiving Recordings

I ___ do give permission for the researchers (Alyssa Currier and her faculty advisors) to keep the video DVDs of my child's testing for as long as they are useful for research about the pre-literacy intervention and communication disorders.

OR

I ___ do NOT give permission for the researchers (Alyssa Currier and her faculty advisors) to keep the video DVDs of my child's testing for as long as they are useful for research about the pre-literacy intervention and communication disorders. If this permission is not granted, DVD recordings will be destroyed within 5 years after the data are collected.

Research Presentations

I ___ do / ___ do not give permission for the researchers (Alyssa Currier and her faculty advisors) to include anonymous video clips of my child in research presentations at scientific conferences.

Information regarding any speech or language disorder (including autism, speech/language delay, stuttering, etc.) is important information in order to determine if this program is beneficial for students with communication disorders. If your child has an Individualized Education Plan (IEP):

I ____ do/ ____ do not give permission for the South Hadley School District to release test results from special education evaluations to the researchers (Alyssa Currier

and her faculty advisors). I understand that this information will not be shared with anyone else and the documents will be kept in a locked filing cabinet.

I ___ do/ ___ do not give permission for the South Hadley School District to release information from my child's Individualized Education Plan (IEP) regarding the services that he or she receives to the researchers (Alyssa Currier and her faculty advisors). I understand that this information will not be shared with anyone else and the documents will be kept in a locked filing cabinet.

_____ _____

Participant (or Guardian or Legal Representative) Signature Date

_____

Participant (or Guardian or Legal Representative) Name, Printed

_____ _____

Signature of Witness to Signature Date

_____

Witness Name, Printed

APPENDIX G

MANUSCRIPT DRAFT

Effects of a Classroom-Based Pre-Literacy Intervention for Preschoolers with Communication Disorders

Abstract

Children with communication disorders are often at risk of literacy difficulties, especially students that present with autism and/or speech sound disorders. This quasi-experimental study is designed to examine the effects of a 10-week "hybrid" intervention for preschool students with and without communication disorders in an integrated classroom. The classroom intervention targets both vocabulary and phonological awareness, two critical components of literacy that are strongly correlated with one another. The objectives of this study are (1) to provide empirical evidence that classroom-based pre-literacy intervention can be effective for students with communication disabilities, allowing for more time with their peers in a potentially least-restrictive environment and (2) to demonstrate that typically-developing preschool children also benefit from classroom-based pre-literacy training.

Key words: phonological awareness, vocabulary, preschool, classroom-based intervention

Introduction

Phonological Awareness and Communication Disorders

Phonological awareness refers to the cognitive skill that allows one to access and reflect upon sounds in one's own language (Mattingly, 1972, as cited in Gillon, 2004). Phonological awareurrness has been described as the single best predictor of reading performance (Liberman, Shankweiler, Liberman, 1989, as cited in Gillon 2004). More specifically, *phonemic awareness* is regarded as one of the most important skills for reading acquisition. Phonemic awareness refers to the awareness of individual segments. Thus, phonemic awareness allows one to perform well on tasks that require blending, segmenting, and manipulating individual sounds.

It is well known that children with communication disorders may be at risk for reading disorders due to poor phonemic awareness. Between 30% and 77% of children with speech sound disorders struggle with reading. This risk increases with severity and persistence of the speech sound disorder, deviant articulation patterns, and comorbid language disorders. It is also reported that half of all children with language disorders experience reading problems in the early school years (Anthony, Aghara, Dunkelberger, Anthony, Williams, Zhang, 2011). Deficits in the areas of phonological and phonemic awareness can result in difficulty with alphabet knowledge, rhyming, phoneme identification (Swan & Goswami, 1997), syllable tasks (Swan & Goswami, 1997), segmental manipulation tasks (Pratt &

Brady, 1988), syllable tasks (Swan and & Goswami, 1997), rapid automatic naming (RAN), and rapid alternating stimulus naming (RAS).

Phonological Skills Required for Reading

Typically, when thinking about phonological processing, there are three components that are considered critical: phonological awareness, phonetic recoding for working memory, and phonological recoding in lexical access. Phonological awareness, as described above, is a fundamental skill that is critical for higher level phonological processing. Phonetic recoding occurs both at the working memory level and the lexical level. At the level of working memory, written symbols of a word are recoded into a sound-based representation in order to maintain the words in working memory, blend the sounds, and form a word. Phonological recoding then happens at the lexical level to access meaning (Baron & Strawson, 1976; Liberman & Mann,1981; Martin, 1978). Phonological awareness has been described as the single best predictor of reading performance (Liberman, Shankweiler, Liberman, 1989, as cited in Gillon, 2004). More importantly, specific phonemic awareness tasks are important predictors including blending (Wagner, Torgesen, Rashotte (1994), segmenting (Share, Jorm, Maclean, & Matthews, 1984), and manipulation (Lundberg, Olofsso, & Wall, 1980).

As mentioned above, one critical component of phonological processing is phonological recoding in lexical access. Written symbols are recoded into phonological representations that then allow access to the lexical representation. Although the relationship between vocabulary and phonological representations is hotly debated (e.g., Elbro, Nielson, & Petersen, 1994, as cited in Wesseling; Walley, 2003; Vihman, 2011), it is evident that vocabulary plays a critical role in reading, as a child is required to access semantic information when decoding (Gillon, 2004).

The theory of lexical restructuring (Walley, 1998) provides one explanation for this relationship. Proponents for this theory accept the idea that lexical representations are initially more wholistic and that they are "forced" to become segmental as vocabulary increases. This forced segmental storage would then allow a child to become more phonemically aware. There are contradictions and variability in the literature that prevent complete acceptance of this theory. Vihman (2011) assumes that phonological representations are dynamic and that children depend on them for word learning. Regardless of the issues of changes in representations, researchers generally do accept the idea that vocabulary provides a foundation for phonological awareness (Walley, Metsala, & Garlock, 2003; Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003).

Phonological representations are likely to be one underlying common denominator for all three weaknesses observed in children with poor phonological awareness. It can also be argued that the three characteristics influence each other. Foy and Mann (2001) specify that phoneme awareness is differentially associated with vocabulary. Furthermore, they found that phoneme awareness is mediated by vocabulary, age, and letter knowledge. Silven, Niemi, Voeten (2002) found that vocabulary size in young children can influence phonological awareness (though not necessarily phonemic awareness as this was not examined). Their research

suggests that those children who were fast-mapping word meanings during infancy could later reflect upon sound patterns more accurately three years later. This supports the idea that early vocabulary knowledge can contribute to language acquisition and ultimately phonological awareness.

Phonological memory is also linked to vocabulary. Performance scores on PM were closely related to scores of vocabulary knowledge in several studies (Gathercole & Baddeley, 1989; Gatherco1e, Willis, Emslie, & Baddeley, 1992). Many researchers view the relationship of PM with vocabulary as a reciprocal one. Phonological memory has been found to influence the learning of new words in young children (Gathercole & Baddeley, 1990). Phonological memory also appears to play a major role in vocabulary development between the age of 4 and 5; however, as a child matures, vocabulary seems to play the bigger role in development (Gathercole, Willis, Emslie, & Baddeley, 1992).

Phonological Awareness Interventions

In most cases, interventions target both the overt symptoms and the underlying deficits as a result of their overlapping nature. Carroll and Snowling (2004) state that children with speech impairment have phonological awareness profiles that are similar to those of children who do not have a speech sound disorder but are at risk for dyslexia. Children who present with other concomitant disorders, such as specific language impairment, may be at greater risk of developing a reading disorder than those with an isolated speech sound disorder (Bird, Bishop, Freeman, 1995; Nathan, Stackhouse, Goulandris & Snowling, 2004). It appears that despite the primary diagnosis, the resulting reading disorder is commonly explained by the phonological deficit hypothesis, which purports an underlying phonological deficit affects "(1) understanding of the sound structure of spoken language, and (2) holding phonological information in short-term memory" (Gillon, 2004, p. 63). Therefore, intervention should take into consideration both the underlying deficits (potential weaknesses in phonological representations and the ability to access these representations) and the symptoms (limited vocabulary; difficulty identifying the initial phonemes in words, segmenting phonemes, etc.). Gillon (2005) highlights four theoretical assumptions used to design the intervention model used in her study on preschoolers with speech impairment:

1) Words are comprised of sound units; therefore, intervention should stress the importance of phoneme awareness and letter knowledge to help facilitate later experiences with decoding and encoding print.
2) Phonemic awareness is more strongly related to long-term reading success compared to syllable or rhyme awareness. Thus, intervention should target phoneme awareness rather than rhyme or syllable awareness.
3) It is believed that only typically developing young children (3 and 4 years of age) begin to acquire phonemic awareness before formal literacy instruction. Therefore, it is critical to take into consideration the developmental progression of children with speech impairment and focus on phoneme awareness (i.e., phoneme identification in words), not mastery of complex skills.

4) Explicit instruction of letter knowledge and phoneme awareness may promote the development of both skills simultaneously.

The results of Gillon's (2005) study indicated that children with speech impairment demonstrated improvements in the area of phoneme awareness. In addition, phoneme awareness was achieved while targeting articulation. This is one example of an intervention that addresses both the underlying causes of poor phonological awareness and the symptoms.

McNeill & Dodd (2009) examined phonological deficits in children with CAS. They found that children with CAS have poorer PA skills than children with other speech sound disorders. They hypothesize that this may be caused by deficits in phonological assembly or the creation of phonological plans for speech output. It is suggested that these deficits "disrupt the translation of words into phonological working memory" (p. 190). Therefore, intervention that targets both verbal motor planning and phonological awareness may improve both underlying representations and speech production. This phenomenon is supported by the Cerebellar Deficit Theory (Nicolson and Fawcett, 1990) and models of dyslexia that purport reading acquisition and dyslexia are inter-related with cognitive, linguistic, fine and gross motor development and deficits in any of these areas. Moriarty & Gillon (2006) examined an integrated approach for three children between 6 and 7 years of age with CAS. Two out of the three children made significant improvements on targeted speech and phonological awareness skills in a therapy program that involved explicit phoneme awareness training (phonemes in isolation, phoneme identification, segmentation, blending, and manipulation with letter blocks).

Most of the interventions mentioned above address single components of pre-literacy, mainly phonological awareness. Munro, Baker, and Lee (2008) argued that a hybrid approach that included both phonological awareness and vocabulary would address two critical components of emergent literacy. Their study sought out to address these skills with an instructional format that included oral narratives to build vocabulary followed by explicit skill instruction for lexical-semantic knowledge and phonological awareness in the form of games. The incorporation of these two elements at once addressed the complex and interdependent relationship between vocabulary and phonological awareness. Munro et al. designed a 6-week hybrid intervention for 17 preschoolers with specific language impairment, and some with concomitant speech sound disorders between the ages of 4 years, 8 months and 6 years, 5 months. Children were seen individually for 6-weeks in a clinical setting. A home program was also established. The intervention consisted of a short picture-based storybooks that offered multiple opportunities to target phonological awareness including alliteration and rhyming. In addition, books offered semantic elaborations of the words in the storybook. After the story was read, structured games were played to further target PA skills and semantic features. Pre-and post-testing showed statistically significant increases in areas including phonological awareness, vocabulary, listening comprehension, and oral narratives. They also showed gains in areas of lexical and sublexical knowledge as measured on word association and word attribute tasks.

Current Study

Using the fundamental principles and design of Munro et al. (2008) study, the current study expanded the investigation of this intervention by changing the setting to an integrated classroom and including a control group. The intervention was moved to the classroom for several reasons: 1) Services for pre-literacy are not always covered by insurance in a clinical setting. Thus, more students are receiving these services at school resulting in a dramatic increase in SLP caseload size. Even when the caseload size is manageable, pre-literacy goals may not get addressed as regularly given other pressing IEP objectives that need more immediate attention, 2) Students who are regularly seen for services (e.g., speech, OT, PT) are continuously missing out on time spent with their peers. The hope of this study was to find an effective intervention that benefited all students in the same classroom at the same time to allow for more peer-to-peer interaction, 3) The current intervention addresses several Common Core State Standards for Kindergarten, which allows this instruction to serve as a preview and practice of phonological awareness skills for all students in the classroom. This preview is especially valuable for students with communication disorders, as early intervention may give them the exposure they need to grasp these skills in the next couple of years in school.

The research questions for the current study included the following:

1) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children in an integrated classroom?

2) What are the treatment effects of a classroom-based hybrid language intervention targeting vocabulary knowledge and phonological awareness on preschool-aged children with communication disorders (autism, speech sound disorder, specific language impairment, etc.)?

3) Are there generalized effects of a classroom-based hybrid pre-literacy instruction and intervention program on oral narrative production and listening comprehension? Note: These skills are not explicitly targeted but are integrated into the intervention as a result of the intervention format.

4) What changes can be measured in lexical-semantic knowledge and sublexical storage and access pre- versus post hybrid intervention?

Methods

Participants

Two preschool classrooms in an elementary school in a suburban town in Western Massachusetts were selected for this study. The median household income for the town in 2009 was $62,465. Ninety one percent of the population is White, 3.2% is Asian, 2.6% is Hispanic or Latino, and 1.4% is African American. Each class is taught by the same teacher; one classroom is taught in the morning and the other is taught in the afternoon. The mean age of all of the preschoolers was 4 years, 7 months. The experimental group comprises 13 students with 8 boys and 5 girls. Within this group, 5 students were receiving services for special needs and have

Individual Educational Plans (IEP). The control group comprises 14 students with 8 boys and 6 girls. Five of these students are receiving services for special needs and have IEPs. The services that the student participants on IEPs were receiving per group include services for disorders that include autism, pragmatic language disorder, speech disorder, language delay, and speech and language disorder.

Table 11: Participant Group, Age, Sex, Race, IEP Status

Group	n	Age Range (Mean)	Sex	Race (%)	Students with IEPs
Experimental	13	4;4- 5;1 (4;9)	M= 8 F= 5	Caucasian = 12 (93%) Hispanic = 1 (7%)	5
Control	13	4;4 – 5;3 (4;11)	M = 6 F = 7	Caucasian = 11 (85%) Hispanic = 2 (15%)	5

Table 12: Participants with IEPs by Group, Age, Sex, Race, and Reason for IEPs

Group	n	Age Range (Mean)	Sex	Race (%)	Reasons for IEPs	
Experimental	5	4;3-5;0 (4;9)	M= 5	Caucasian = 4 (80%) Hispanic = 1 (20%)	Phonological Delay/Disorder	3
					Expressive Lang. Disorder	1
					Mixed Receptive/Expressive Lang. Disorder	4
					Pragmatic Disorder/Autism	2
Control	5	4;5-5;3 (4;6)	M = 4 F = 1	Caucasian = 5 (100%) Hispanic = 0 (0%)	Phonological Delay/Disorder	2
					Expressive Lang. Disorder	1
					Mixed Receptive/Expressive Lang. Disorder	2
					Pragmatic Disorder	1

Procedures and Research Design

Several standardized and non-standardized measures were used to assess vocabulary and pre-literacy skills. Assessments were conducted by the principle investigator and were video recorded at each time of testing. The study used a quasi-experimental design with both the control group and the experimental group consisting a two language-based preschool classrooms from the same school. The same teacher taught both classes (one in the morning and one in the afternoon); however, contamination was not an issue due to the highly controlled intervention materials and instruction methods by the investigator. The control group received "treatment as is" from the classroom teacher which consisted of a variation of the *Handwriting Without Tears®* program. The experimental group also received this instruction.

Each participant was assessed at pre- and post-intervention using seven different measures as outlined in Table 3. Assessments that targeted vocabulary and phonological awareness were included to measure skills taught during the intervention. Measures of listening comprehension and oral narrative production were used to examine potential changes in language understanding and vocabulary use. Several measures were comparable to the Munro et al. (2008) study and three were a variation of their measures, including an American version of the *Pre-Reading Inventory of Phonological Awareness (PIPA),* and the *Word Attribute Identification Task and Word Association Task.* The two latter are discussed in more detail below.

Table 13: Dependent Variables: Standardized and Non-Standardized Measures

Assessment	Domain	Variable
Standardized		
Pre-Reading Inventory of Phonological Awareness (PIPA)	Phonological Awareness	Raw Score
Expressive Vocabulary Test-2nd Edition (EVT-2)	Expressive Vocabulary	Raw Score
Peabody Picture Vocabulary Test-4th Edition (PPVT-4)	Receptive Vocabulary	Raw Score
Clinical Evaluation of Language Fundamentals-Sentence Structure Subtest (CELF-P:2)	Listening Comprehension	Raw Scores
Non-Standardized		
Word Attribute Identification Task	Lexical & Sublexical Knowledge	Mean Percent Correct
Word Association Task	Lexical Knowledge	Rate of Response
Edmonton Narrative Norms Instrument (ENNI)	Oral narratives (use of vocabulary)	MLU, NDW. TTR

MLU = Mean Length of Utterance; NDW = Number of Different Words; TTR= Type-Token Ratio

The first task is a *word attribute identification task* that included 36 high-frequency nouns. 18 nouns were explicitly trained during the intervention; 18 remained untrained. The trained words served as direct measures of the intervention and the untrained words served to test generalization of the intervention. Two levels of knowledge were examined. For the first level (lexical-semantic), the student was asked to name a function, attribute, or an associative feature of the word. The next level (sublexical) measured his/her awareness of phonological properties of words. The child received a score for trained and untrained lexical-semantic and sublexical items.

The second experimental task was a *word-association task*. Twelve high frequency words (10 nouns, 2 adjectives) were presented to the child at pre-testing. At post-testing, the students were given the same 12 words along with 4 words that

were targeted directly in the intervention. The 4 new words were used to note any responses that reflected learning during the intervention. The child was given 20 seconds to name as many words as he/she could that are associated with each item. The responses were coded using a system adapted by Cronin (2002, as cited in Munro, Lee, and Baker, 2007) and Sheng, McGregor, and Marian (2006). Items were coded under the following categories: a) syntagmatic (thematic relationship/found within a sentence); b) paradigmatic (shares a taxonomic relationship with the item—synonyms, antonyms, subordinates and coordinates); c) clang (shares a rhyming or alliteration feature), d) multiword (uses multiple words in response), e) repeat, and f) not related. Two coders conducted item-by-item reliability analysis of the response categories for all responses. The coders agreed on 97.1% of the responses. Consensus agreement was reached on the remaining 2.9%.

Intervention Procedure and Material

The intervention was delivered in two different formats two days a week for 10 weeks. The entire class (experimental group) received whole-group instruction on Wednesday of each week of the intervention phase during their scheduled "circle time." The instructor taught two letters/sounds per week. When introducing a new letter and sound, the instructor presented a large printed letter that hung prominently on the backdrop for the duration of the instruction. The instructor then pre-taught the vocabulary words that were found in a short storybook. A total of twenty books were written and illustrated specifically for the purposes of this instruction. These books contained a variety of words that begin with the targeted sound. After each page was read, the instructor prompted the students to identify words that start with the target sound. Books were no longer than 5 pages in length with one to three lines of text per page. Two structured games immediately followed the book reading. The first game addressed phonemic awareness, specifically initial phoneme identification. Using a hanging pocket organizer, the instructor presented three pictures to the class. Some pictures were directly from the book and some are not. The pictures did not contain the written form of the word. The instructor asked the students to identify which word begins with the target sound out of a field of three pictures. This is repeated for another round of words. The next two rounds of the game asked the students to identify which words did not begin with the target sound. One foil was included in this round meaning that one picture did begin with the target sound, but it was not from the book.

The second game was an interactive vocabulary game. The vocabulary word was directly related to the book, as well. For instance, if the target sound was /d/ and the book was about a dog, then the vocabulary game focused on the lexical and sub-lexical concepts associated with the word dog. The instructor used a 2x2 grid (as shown in Figure 1) on a large felt mat to divide four concepts related to the vocabulary word. This game was referred to as "Four Corners". For example, in one corner, the class discussed the semantic features of the word dog using pictures including size, color, sounds, and parts of the whole. The next corner addressed the function or location (or both) of the word dog. The third corner addresses the word associations of the word dog. The fourth corner uses pictures to teach words that

rhyme with dog. The dialogue within this game offered multiple opportunities for further semantic elaborations (e.g., "A dog has paws. He uses them to dig."). Student comments and questions that reflected semantic, phonemic awareness, or narrative related features were reinforced with positive responses from the instructor. Formal lesson plans and dialogic scripts were written in advance. Large group instruction was video recorded in order to examine treatment fidelity.

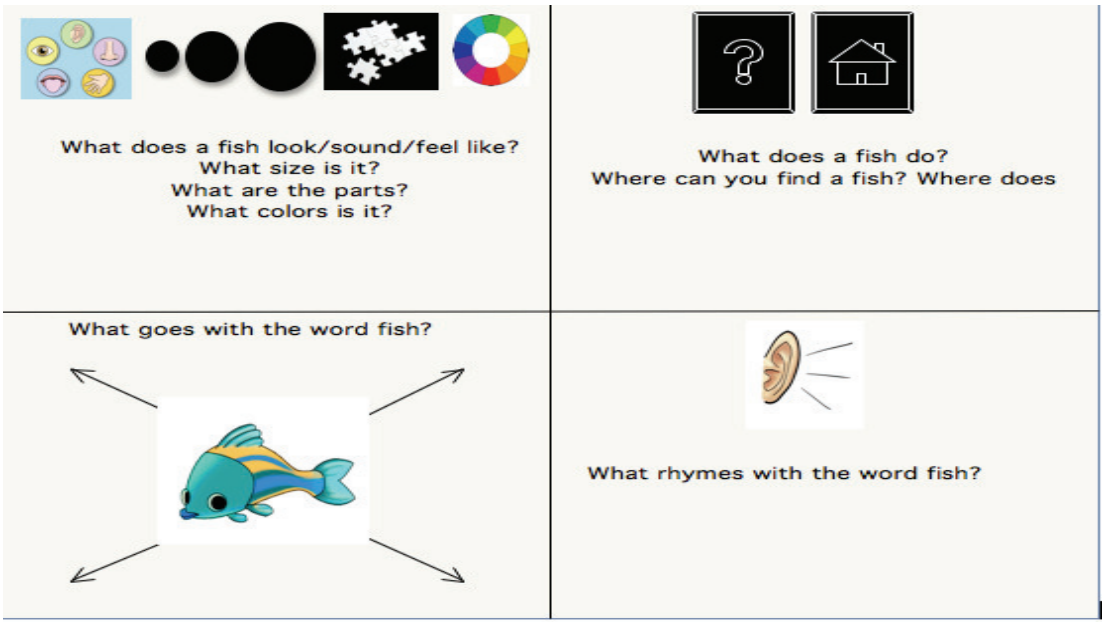


Figure 1: Model of Instructional Grid and Visuals

As the weeks continued, new phonological awareness concepts were added to the curriculum in the first part of each lesson. These concepts followed the phonological awareness hierarchy as outlined by Pufpaff (2009). Note that rhyme awareness is targeted each week as part of the "Four Corners" game. Each week the instruction included phoneme awareness (two sounds each week). As the weeks progressed, the curriculum included syllable segmentation, phoneme blending, and phoneme segmenting.

For items that targeted syllable segmentation, phoneme blending, and phoneme segmentation, a number of visual supports were used. For syllable segmentation, each student received a laminated strip of paper with five large colored circles (Figure 2). The instructor guided the students to use the circles to tap out the syllables, followed by the option to clap out the syllables. For phoneme blending and segmenting, students were shown large laminated sheets of paper where each sheet represented a phoneme. For blending, the instructor would move the sheet of paper down the display as each phoneme was spoken. Once a few students had turns to answer, the instructor would write the letters of the sounds on the sheets of paper and repeat the segmentation and blending in order for students to see the letter-sound relationship. For segmenting, the instructor would lay blank sheets on the floor and students would manipulate the sheets to segment

the sounds. After a few correct trials had been completed, the instructor would write the letters on the sheets of paper and repeat the whole-word to segmentation process.

On Day 2 instruction, which immediately followed the Day 1 of large group instruction, the same instructor followed the same lesson plan for phonological awareness with small groups of three to four. The book was used as a review of the vocabulary and initial sound awareness; however, the full vocabulary lesson with the explicit instruction of the semantic features was not repeated due to time limitations. The instructor used the same script for the PA lessons. Groups changed on a weekly basis to accommodate classroom needs and other unrelated variables, and consisted of a mix of typically developing students and students with communication disorders. The purpose of the small-group instruction was twofold: (1) to review the material taught in the whole-group instruction the previous day, (2) to serve as a more intensive instruction, as whole-group instruction in isolation has been found to be less effective than small-group instruction when teaching phonological awareness.

Treatment Fidelity

Treatment fidelity was evaluated by an independent speech-language pathology graduate student to determine the consistency of the instruction for all portions of the large group instruction including the storybook reading and questions, the phonological awareness games, and the vocabulary games. Two large group session videos (20% of the intervention) were chosen at random and given to the evaluator along with the lesson plans. The evaluator then observed each video and code each utterance using the following categories: 1) Reflected lesson plan, 2) Response to child's comment or child's questions, 3) Behavioral support/redirection, 3) Other. The "Other" category consisted of utterances that were directed at the classroom teacher for clarification or others adult staff who may have been present in the classroom.

For the two sessions observed, the percentages of utterances that reflected lesson plans was 46% and 53%. The percentages observed for utterances that related to a child's comment or question was 30% and 36%. Utterances that addressed behavior were observed in 22% and 8% of all the utterances and 3% of utterances in both sessions were observed as "other." These results show that on average, lesson-related utterances accounted for 83% of the total number of utterances spoken by the instructor. This supports the notion that the intervention was carried out with fidelity and that the majority of the sessions were child-focused with much of the interaction focusing on teaching or responding to child-initiated comments or questions.

Data Analysis

The differences in pre- and post- means were calculated for each standardized and non-standardized measure and analyzed using multiple independent *t*-tests. Effect size was calculated using Cohen's d using the cutoff values of values for small (0.2-0.5), moderate (0.5-0.8) and large effect size (>0.8).

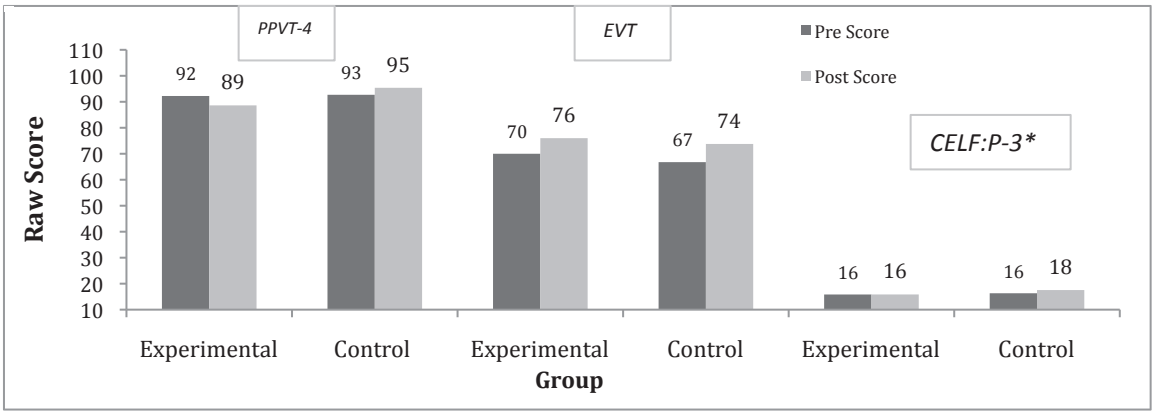
Results

Results of the standardized measures for vocabulary, listening comprehension, and phonological awareness for each group were compared. At baseline, the experimental group and the control group showed relatively equivalent means for the *PPVT-4*, with mean scores of 92.23 (*SD = 24.60*) and 92.69 (*SD = 24.08*), respectively. Pre-test results on the *EVT* were slightly different between groups with the experimental group averaging a raw score of 70.0 (*SD = 12.75*), and the control group demonstrating a mean of 66.77 (*SD = 17.11*). Both groups also demonstrated similar scores at baseline for listening comprehension with a mean raw score of 15.83 (*SD= 5.41*) for the experimental group and 16.31 (*SD = 3.88*) for the control group. Using a significance level of 0.05, the results show that there were no statistically significant discrepancies in performance between the experimental group and the control group on measures of vocabulary and listening comprehension. Figure 2 is a side-by-side visual comparison on pre- and post-scores for three standardized measures including the *PPVT-4, EVT*, and *CELF:P-3*.

Table 14: Results for Standardized Measures of Vocabulary and Listening Comprehension at Pre- and Post- Intervention (n = 26)

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences Pre- and Post-	SD Pre- and Post-	t	Sig.
PPVT-4								
Experimental	92.23	24.60	86.62	27.77	-3.61	20.65	-1.27	.107
Control	92.69	24.08	95.38	21.44	2.69	21.44		
EVT								
Experimental	70.0	12.85	76.0	19.88	6.00	17.51	.832	.423
Control	66.77	17.11	73.77	16.58	7.00	5.60		
CELF-4								
Sentence Structure								
Experimental	15.83	5.41	15.85	6.31	-0.166	4.89	-.870	.196
Control	16.31	3.88	17.54	2.76	1.23	2.62		

α = 0.05; SD, standard deviation



* Highest possible raw score is 20

Figure 2: Pre and Post Raw Scores for PPVT-4, EVT-2, and CELF:P-3 by Group (n=13)

Table 5 presents the results of independent t-tests and significance levels for measures of phonological and phonemic awareness as measured by the PIPA. The results of these t-tests show that there were no statistically significant changes in pre- and post-performance between the two groups.

Table 15: Results of the PIPA Subtests at Pre- and Post- Intervention (n=26)

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences Pre- and Post-	SD Pre- and Post-	*t*	*Sig.*
Rhyme Awareness								
Experimental	4.7	3.27	6.54	3.71	1.77	3.09	.290	.387
Control	4.69	3.07	6.15	2.12	1.46	2.26		
Syllable Segmentation								
Experimental	6.31	3.92	7.69	3.86	1.38	3.64	-.06	.476
Control	5.77	2.28	7.23	3.72	1.46	2.82		
Alliteration Awareness								
Experimental								
Control	3.23	3.24	4.54	3.84	1.31	1.55	1.08	.14
	3.77	2.62	4.31	2.66	0.54	2.03		
Sound Isolation								
Experimental	3.69	4.52	5.08	4.37	1.38	3.62	-.31	.378
Control	2.77	3.39	4.54	3.91	1.77	2.55		
Sound Segmentation								
Experimental	0.38	0.77	0.62	1.19	0.23	1.17	1.33	.097
Control	0.54	1.39	0.15	0.38	-0.38	1.19		
Letter-Sound Knowledge							.130	.44
Experimental	4.15	6.73	7.85	6.99	3.69	3.35		
Control	2.31	3.15	5.85	5.08	3.54	2.67		

α = 0.05; SD, standard deviation

Word Attribute Identification Task

The *word attribute identification task* examined both lexical and sub-lexical knowledge of 36 words, 18 trained and 18 untrained. Results of the word attribute task were analyzed using independent *t*-tests. Using a significance level of 0.05, the results show a statistically significant difference between groups for trained items. The experimental group showed significant gains in performance at post-intervention for semantic items ($t = 2.03$, $p = .05$) with a medium effect size (ES = .80) and phonological awareness items ($t = 4.67$, $p = .00$) with a large effect size (ES = 1.8). There were no significant differences between groups for untrained semantic ($t = .294$, $p = .77$) and phonological awareness items ($t = -1.05$, $p = .30$). Results indicate that the experimental group showed improvement in understanding lexical-semantic and sub-lexical features (phonological awareness) of words to which they were exposed during the intervention. Table 7 summarizes the mean correct performance between the two groups at pre- and post-intervention.

Word Association Task

The *word association task* was administered to each student at pre- and post-intervention. Ten high-frequency nouns and two adjectives were included in the measure at pre-intervention. High-frequency words were selected from The Educator's Word Frequency Guide (Zeno, Ivens, Millard, & Duvvuri, R. 1995). At post-intervention, the same words were included, as well as four words that were directly targeted during the intervention (surfer, zoo, baby, and garden). Students were read the following directions: "I'm going to say a word. When I say 'go' I want you to name all the things that go with that word. Let's try some together." The students then had two trial items to practice the task. Students had twenty seconds for each stimulus word. Each response was coded into six possible categories with some words falling into two or more categories. For instance, if the stimulus word was baby and the student said "bottle," the word could be categorized as syntagmatic due to the likelihood that bottle and baby could be found in the same sentence and clang due to the alliterative relationship.

All words that were coded as multiple word responses were also coded as paradigmatic or syntagmatic. For instance, if the stimulus word was car and the response was "drive the car" then the response would be coded as multiword-syntagmatic. If the response was "cars and trucks" the response would be coded as multiword-paradigmatic since cars and trucks are coordinates. The majority of the responses were single-word utterances for both groups at both pre-and post-intervention, with the largest category being syntagmatic. Of the responses that were multiword, the majority of them were multiword syntagmatic.

In order to identify changes in performance, the percentage of each category among all of the responses for each child at pre and post testing. The purpose of this analysis was to identify the differences in the overall quality of responses on average for both groups, as well as the individuals with communication disorders (as discussed below). For instance, an increase in the percentage of syntagmatic or paradigmatic responses post-testing would reflect more appropriate responses. Given that word associations were directly taught during the intervention, the experimental group was expected to show an increase in these two categories. No significant differences were found between the two groups. Results of this analysis are summarized in Table 6.

Table 6: Word Association Task: Pre-Post Differences in Mean Percentage Per Category

Category	Pre Mean Percentage	Post Mean Percentage	Difference from Pre to Post	*t*	*Sig.*
Paradigmatic					
Experimental	10.05 %	11.40 %	1.35	1.15	.13
Control	16.38 %	11.09 %	-5.26		
Syntagmatic					
Experimental	52.36 %	55.15 %	2.79	.12	.45
Control	47.6 %	49.3%	1.70		
Clang					
Experimental	12.61 %	7.04 %	-5.57	.39	.35
Control	13.61 %	3.44 %	-10.17		

Repeated					
Experimental	5.82 %	9.11 %	3.29	-.70	.25
Control	6.03 %	11.73 %	5.70		
Multiple Word-Paradigmatic	0.00 %	0.50 %	0.50	1.36	.09
Experimental	1.63 %	0.47 %	-1.16		
Control					
Multiple Word-Syntagmatic	4.83 %	6.18 %	1.38	.75	.23
Experimental	11.25 %	8.95 %	-2.30		
Control					
Not Related					
Experimental	8.24 %	5.71 %	-2.53	-.75	.23
Control	10.35 %	13.4 %	3.05		

Narratives

Using The Edmonton Narrative Norms Instrument (ENNI), each student was given a trial set of picture prompts followed by three sets of picture prompts, each one increasing in length. Due to the length of the prompt and opportunities to practice, the last of the three narrative samples from each child at pre- and post-intervention testing were used for this study. Narratives were transcribed and coded using the SALT software and analyzed to examine the following: Mean Length of Utterance (MLU), Number of Different Words (NDW), and Type-Token Ratio (TTR).

Table 10 is a summary of the descriptive data for narrative measures. Mean length of utterance was chosen as a metric measure of the children's grammatical skills. An independent t-test of pre and post mean differences did not indicate a statistically significant difference between the two groups ($t = -2.06$, $p = 4.19$).

Number of different words was selected as an index of the quality of the children's stories. Both groups made gains at post-intervention and no statistically significant difference between groups at post-intervention ($t = 0.391$, $p = 0.35$).

Finally, the type-token ratio was selected to measure the vocabulary variation within the children's narratives. Differences from pre to post were minimal for both groups. No statistically significant differences were observed.

Table 16: Results of Narrative Task

Measure	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Mean Differences	SD	*t*	*Sig.*
MLU								
Experimental	6.24	1.85	6.47	1.64	0.36	1.17		
Control	5.73	1.18	6.08	1.62	0.48	1.55	-.206	.419
NDW								
Experimental	34.81	5.81	43.64	15.05	8.81	12.20		
Control	36.82	14.22	42.67	14.22	6.81	11.76	.391	.35
TTR								
Experimental	0.44	0.07	0.46	0.07	0.01	.10		
Control	0.46	0.65	0.51	0.07	0.04	.08	-.883	.19

$\alpha = 0.05$
SD, standard deviation

Results for Individuals with Communication Disorders

Results for the five students with communication disorders in the experimental group were examined as individual participants in order to further assess the effectiveness of the intervention.

Student 1

Student 1, a male, was 4 years, 3 months at the beginning of the study. Permission to access this student's Individualized Educational Program (IEP) for the purposes of this study was denied; thus, the precise reasons for special education services cannot be reported. Upon observation, Student 1 had some developmental sound substitutions and some difficulty with multi-step directions. Attention was also inconsistent and overall compliance in the classroom was variable. He was present for a total of 9 large group intervention sessions and 10 small group intervention sessions. It should be noted that Student 1 had significant behavioral challenges at post-intervention testing for measures of receptive and expressive vocabulary and listening comprehension. Therefore the following scores are not an accurate representation of this student's skills. Student 1 showed a dramatic 46-point decrease in performance from pre- to post-intervention on the *PPVT-4* and a 10-point decrease on the *EVT* from pre-to post-intervention. On the *CELF-P:3,* He received a raw score of 16 at pre-intervention and a raw score of 2 at post-intervention. Slight improvements were made in the areas of phonological awareness as measured on the *PIPA* with Syllable Segmentation and Letter-Sound Knowledge being the two subtests with the greatest gains. Figure 3 shows the changes in performance on each subtest from pre-to post-intervention for Student 1.

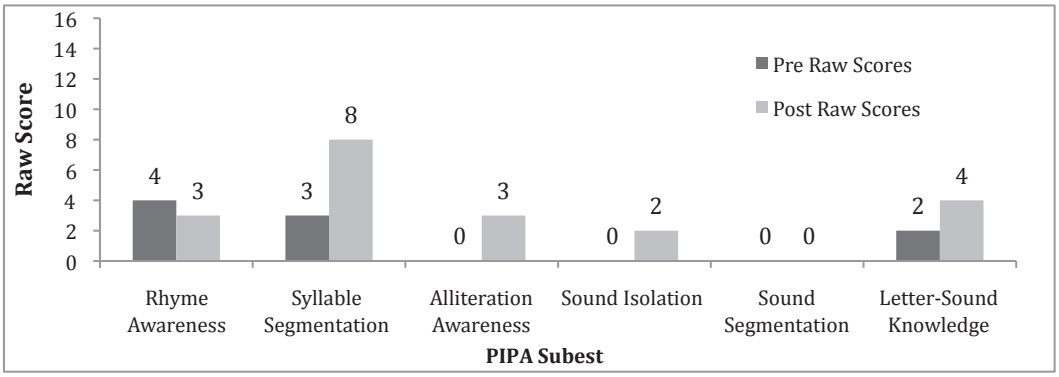


Figure 3: Student 1 Pre and Post Raw PIPA Scores

Student 1 also made gains on the *word attribute identification task.* Several gains were made in the areas of trained semantic and sublexical items. A summary of results is displayed in Figure 3.

With regard to the *word association task*, Student 1 did not increase the percentage of response in the categories that are considered more mature (syntagmatic or paradigmatic). Figure 4 reflects similar results in the overall percentage of each category for all responses at pre and post testing. The majority

of his responses did not indicate maturity or significant development of his lexical-semantic skills.

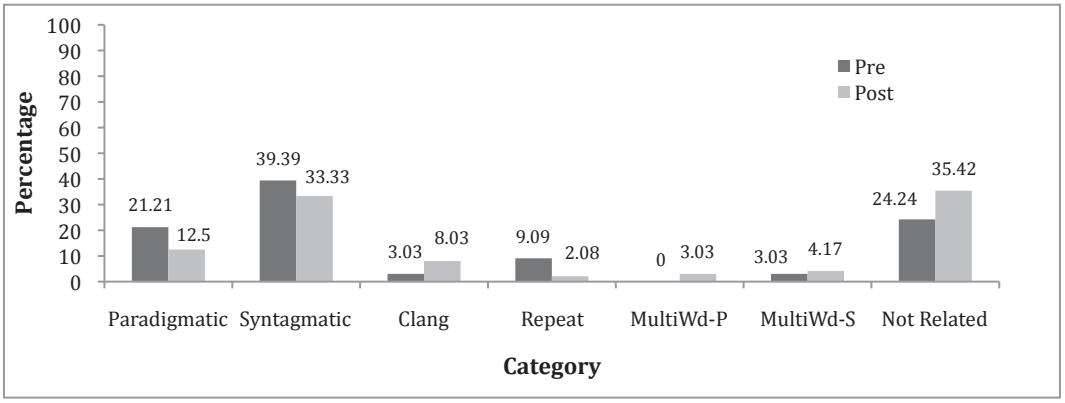


Figure 4: Student 1 Percentage of Each Category for All Responses

Student 2

Student 2, a male, was 5 years, 9 months at the beginning of the study. Student 2 had a diagnosis of autism and received speech-language services, as well as occupational therapy. Adaptive behavioral functioning was considered to be in the "low range", as were auditory comprehension and expressive communication. Student 2 was present for a total of 9 large group sessions and 10 small group sessions. Not all testing could be completed largely due to Student 2's difficulty understanding the task and lack of attention during testing. Completed tests include the *PPVT-4*, *EVT*, the *CELF:P-3* subtest, and the *word identification task*. Student 2 was unable to complete the *PIPA*, the narrative task, and the *word association task*. Performance at pre- and post-testing on the *PPVT-4* remained quite low with raw scores of 34 and 35, respectively. Raw scores for the *EVT* were somewhat higher, though still well below the average range, with a raw score of 41 at baseline and 44 following the intervention. Performance on the Sentence Structure subtest of the *CELF:P-3* improved from a raw score of zero to 4.

Small gains were seen on the *word attribute task.* Student 2 improved from 0% to 22.22% correct for trained semantic items and stayed at 44% correct for untrained semantic items. For sub-lexical items, Student 2 improved from 0% to 33% correct on trained sub-lexical items and remained at 0% correct for untrained sub-lexical items. Although changes were minimal, more changes were seen on trained items versus untrained items. A summary of Student 2's performance can be seen in Figure 4.

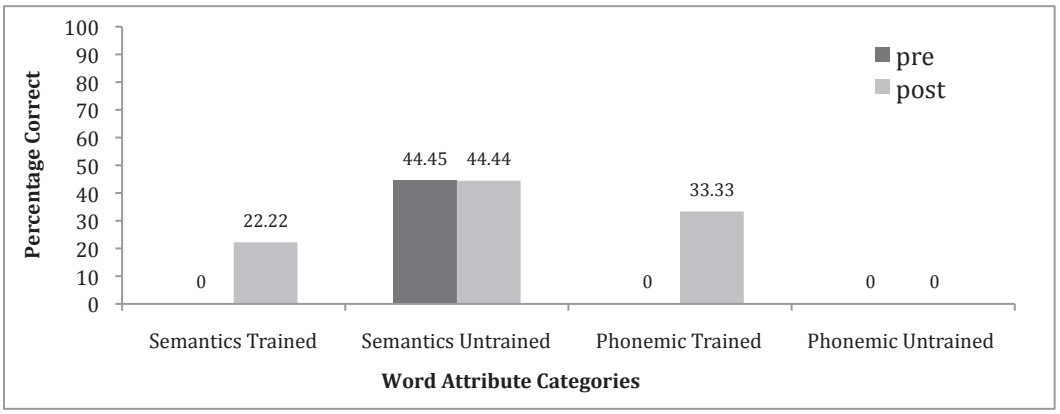


Figure 5: Student 2 Results of the Word Attribute Task

Student 3

Student 3, age 5 years, 1 month, male, was receiving special education services due to a moderate overall delay of expressive and receptive language. Some phonological substitutions were also present. Student 3 was placed in the language-based classroom for preschool for this purpose and received occupational therapy services, as well.

Student 3 was present for 8 large group sessions and 7 small group sessions. Gains were made on measures of receptive vocabulary with a 15-point improvement on the *PPVT-4* (63 to 78). Expressive vocabulary scores decreased slightly from 58 to 53 following intervention. A two-point gain was made on the *CELF:P-3* subtest with raw scores of 13 and 15. Results of the *PIPA* were varied. Results of the *PIPA* scores at pre- and post-intervention for Student 3 are displayed in Figure 6.

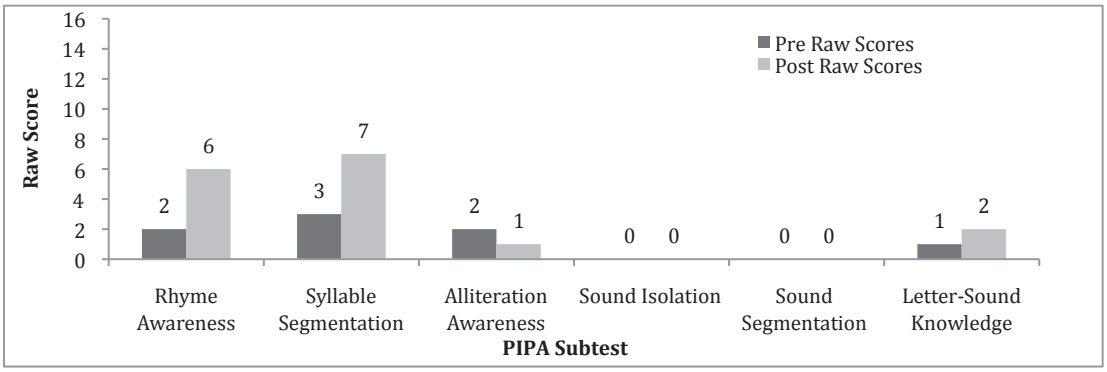


Figure 6: Student 3 Pre and Post Raw PIPA Scores

On the *word attribute identification task*, Student 3 made gains on all items with the exception of phonemic untrained. Results are displayed in Figure 6.

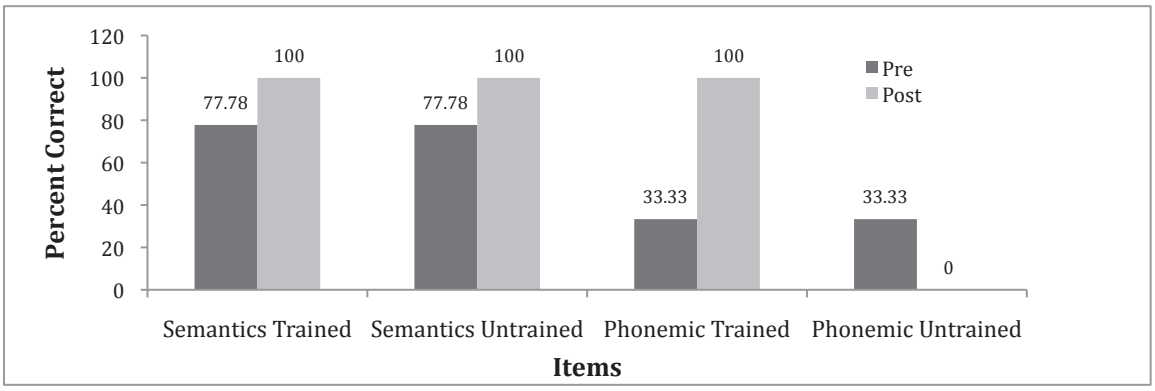


Figure 7: Student 3 Results of the Word Attribute Identification Task

Student 3's performance on the *word association task* was variable. Figure 8 is a summary of the overall percentage of each category at pre and post. Although his rate of paradigmatic responses increased from 1 to 1.25, the actual percentage of these responses decreased. Further analysis shows that his total number of responses increased from 29 to 53; however, repeated responses account for the majority of this increase. At the same time, his overall rate and percentage of syntagmatic responses increased indicating some growth.

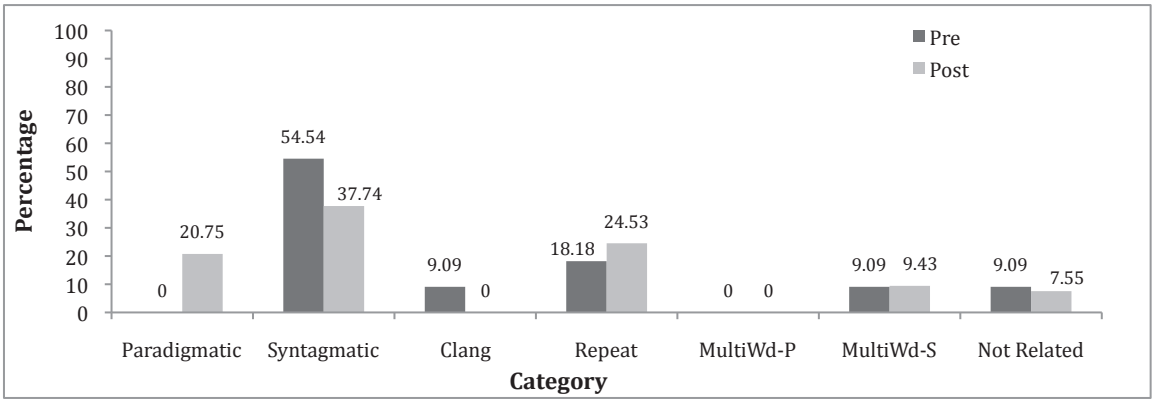


Figure 8: Student 3 Percentage of Each Category for All Responses

Student 4

Student 4, a male, was 5 years, 0 months at the onset of the study. Student 4 was receiving special education services due to expressive, receptive, and pragmatic language difficulties as a result of developmental delay. A few phonological errors were also present. Services also addressed attention, memory, perception, and reasoning. Motor skills were also moderately low.

Student 4 was present for all large group and small group sessions. Overall performance on standardized measures decreased from pre- to post-intervention with the exception of one subtest on the *PIPA*. Student 4 received a raw score of 87 at baseline and a raw score of 82 following intervention. A decrease in performance on the *EVT* was also observed with an 11-point decrease (pre = 69, post = 58). Raw scores on the *CELF:P-3* Sentence Structure subtest also decreased from 16 to 12.

With the exception of two subtests, Student 4 performed more poorly at post-intervention. Figure 9 shows raw scores for *PIPA* at pre- and post-intervention.

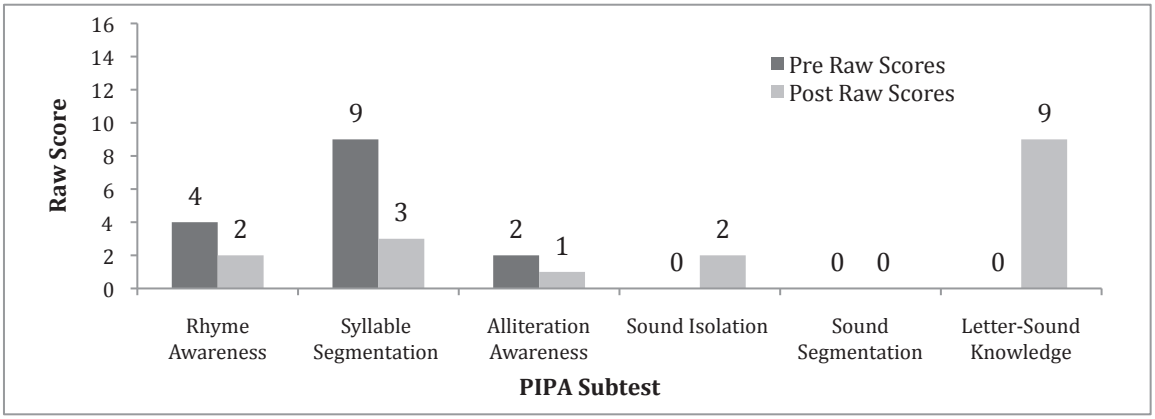


Figure 9: Student 4 Pre and Post Raw PIPA Scores

Outcomes on the *word attribute task* for Student 4 were mixed with little improvement on phonemic trained items only. Results can be found in Figure 10.

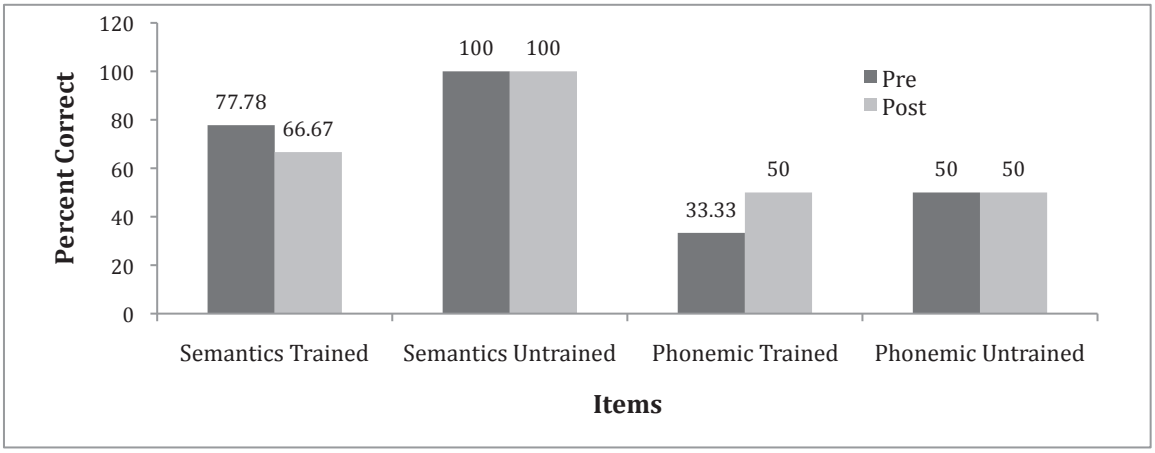


Figure 220: Student 4 Results of the Word Attribute Task

A dramatic difference was seen in post-intervention *responses to the word association task* for Student 4. The total number of responses increased from 12 to 29 from pre to post. Analysis of the categorical percentages showed that Student 4 did respond with more paradigmatic answers. Although the rate of syntagmatic responses increased at post-testing, overall, the percentage of this type of response was fairly constant relative to the number of productions. Figure 11 summarizes the percentages for each category at pre and post.

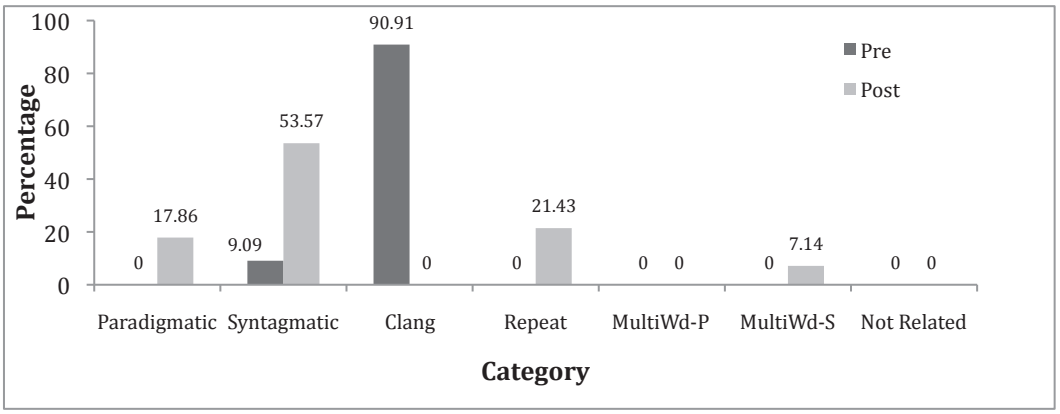


Figure 11: Student 4 Percentage of Each Category for All Responses

Student 5

Student 5, also male, was 5 years, 0 months at the start of the study. He was receiving speech and language services to address a moderate phonological disorder. He also received occupational and physical therapy services. Language and cognitive skills were in the average range.

Student 5 was present for all of the large and small intervention sessions. Performance on measures of vocabulary (*PPVT-4* pre- and post-: 104, 105; EVT pre- and post: 78, 80) and listening comprehension (*CELF:P-3* pre- and post-: 18, 18) remained the same at pre- and post-intervention. Student 5 made 2-3-point gains on all subtests of the *PIPA*, with the exception of the Letter-Sound Knowledge subtest where a 6-point gain was made following the intervention. Figure 12 shows Student 4's raw scores on the *PIPA* at pre- and post-intervention.

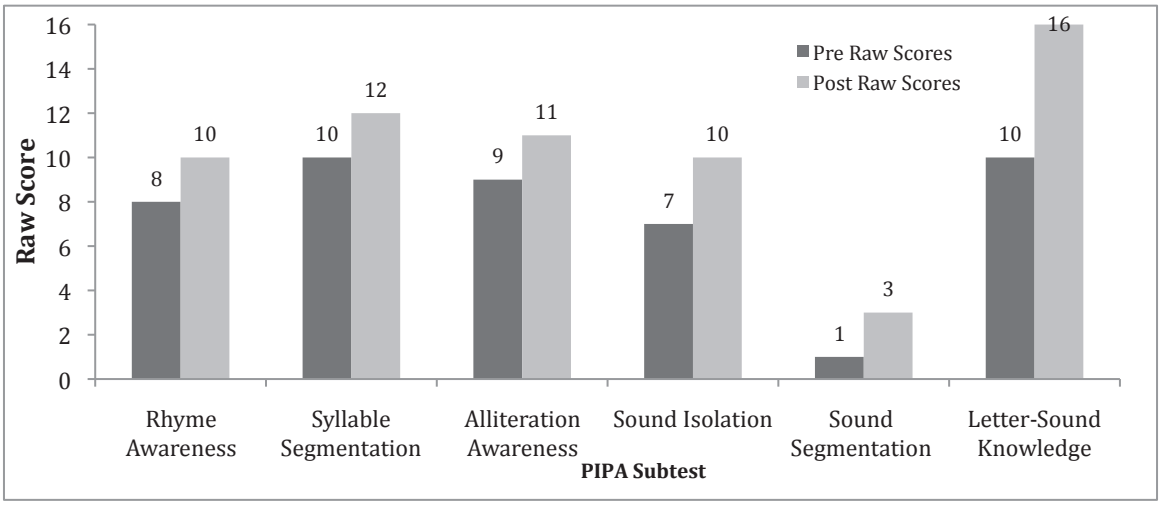


Figure 12: Student 5 Pre and Post Raw PIPA Scores

Student 5 had a relatively high percentage correct at baseline for the *word attribute task* in all categories, with the exception of the trained sub-lexical items; however, a large increase was seen on trained sub-lexical items with a baseline of 50% accuracy and a final 100% accuracy.

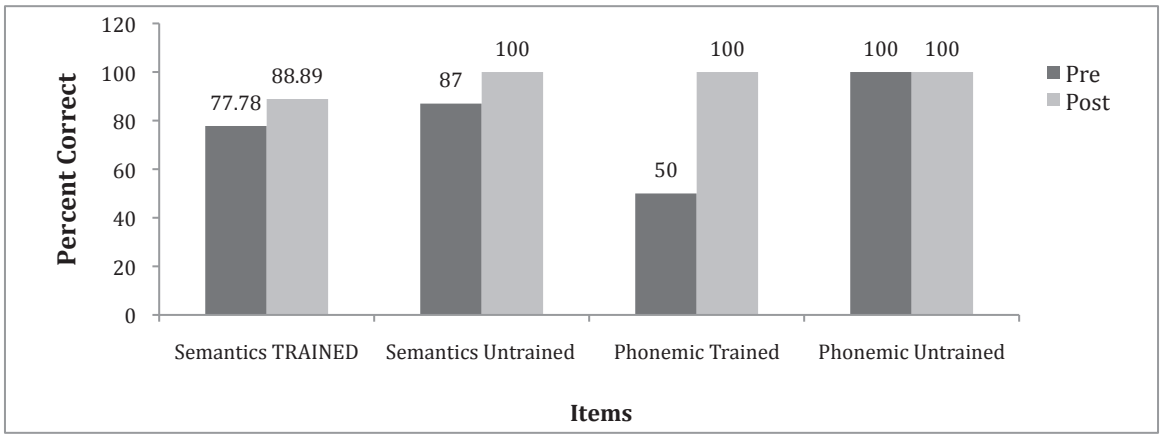


Figure 13: Student 5 Results of the Word Attribute Identification Task

Student 5 remained relatively constant for his performance on the *word association task*. The majority of his responses were of the syntagmatic type, which was also true for his post-intervention responses. The total number of syntagmatic responses also increased relative to the total number of answers produced. Overall, Student 5 produced similar answers before and after the intervention.

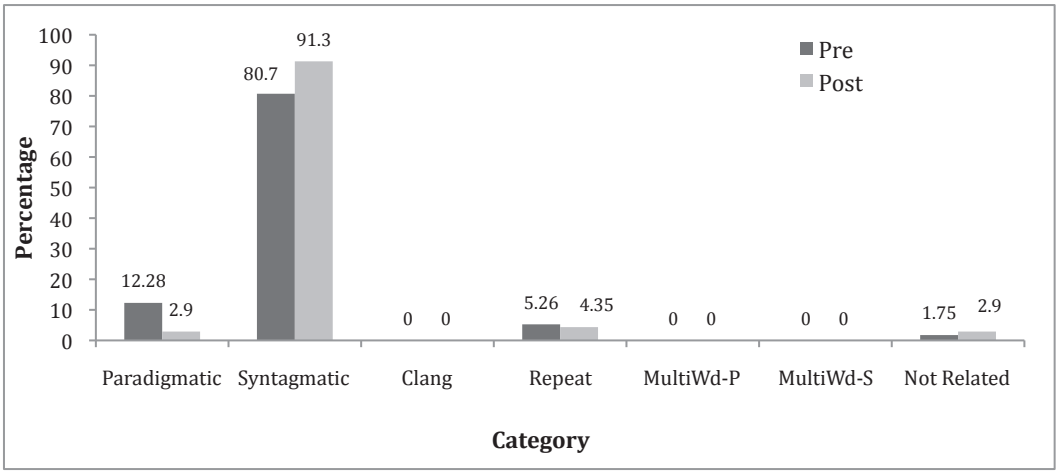


Figure 14: Student 5 Percentage of Each Category for All Responses

Discussion

Group Effects

Outcomes of this study support the notion that pre-literacy training for preschoolers, especially those at risk for developing reading disorders, is useful, yet challenging when carried out in the classroom. After a 10-week classroom-based intervention, statistically significant differences were not found between the experimental group and the control group on standardized measures of receptive and expressive vocabulary, listening comprehension, and phonological awareness. Therefore, maturation cannot be ruled out as a possible explanation for increases in performance on these measures for the experimental group.

Statistically significant differences were found between the two groups on one non-standardized task with the experimental group performing better on items in the word attribute task that assessed lexical-semantic and sub-lexical knowledge of trained words. That is, students who were explicitly taught the lexical-semantic and sub-lexical features of target words during the intervention answered more questions about these words correctly than those students in the control group. It is hypothesized that these results are a direct result of the explicit teaching of these words during intervention. Of note, while the students' scores did not improve on measures of vocabulary expansion (i.e., PPVT-4, EVT), they did improve performance on items that measured vocabulary depth, as demonstrated on the word attribute task. Students in the experimental group performed better on trained items; however, there were no differences between the groups on untrained items (for both lexical-semantic and sub-lexical). This suggests that knowledge of word attributes did not generalize to untrained items. These results may indicate that explicit teaching of semantic features is a valuable method for the preschool classroom, especially for those with communication disorders.

The purpose of the *word association task* was to measure the quality of responses generated by each student. For instance, if the student generated a single-word response that shared a paradigmatic or syntagmatic relationship with the target word, these responses were considered to be more mature, demonstrating a more intricate knowledge of the vocabulary word. However, if the student responded with a multi-word utterance, or a rhyming word, or repeated the target word, it could be assumed that the child either did not understand the task or the child may have difficulty accessing related words. Of the single word responses, the majority of the words generated by both groups were of the syntagmatic category. This was the predicted outcome given the theory of the "syntagmatic-paradigmatic shift", a developmental phenomenon which suggests that children 5 years and under typically respond with answers that fall in the syntactic category. Around the age of 9, children tend shift to answers that are paradigmatic, which suggests a more mature semantic system (Lippman, 1971). The intervention included explicit exercises in word associations each week. Thus, it was predicted that students in the experimental group would perform better on this task compared to their peers in the control. However, the performances of the students in the experimental group appeared to be just as variable as those of the control group with no statistical differences from pre- to post intervention.

There were no statistically significant differences between the two groups on any language measures used to analyze the oral narratives including Mean Length of Utterance (MLU), Number of Different Words (NDW), and Type-Token Ratio (TTR). Both groups made substantial gains on NDW, but the differences were not significant between groups. Thus, the outcomes are both likely due to maturation. There are a number of possible reasons why the experimental group did not perform significantly better on these measures. The narratives were not explicitly taught as part of the intervention; rather they were an imbedded tool used to create context for the vocabulary and the phonological awareness lessons. Students were not asked to *use* the vocabulary, only to learn the features. It can be assumed that

the general vocabulary lessons in this intervention did not generalize to the students' use of vocabulary in a narrative setting, only their understanding of features. This may be a valuable consideration for those who are selecting or designing appropriate interventions. That is to say that an intervention designed to only increase the depth of vocabulary knowledge may not increase a student's use of vocabulary, and vice versa.

Individuals with Communication Disorders

Gains were made on a number of measures for students with communication disorders; however, these gains were inconsistent within this group. The student with a mixed language and phonological disorder (Student 3) and those with language disorders (Student 1 and 4) appeared to do more poorly on measures of phonological awareness skills that required sound isolation and segmentation than the one child with a phonological disorder (Student 5). Phoneme segmentation is considered one of the more advanced skills that are directly related to reading acquisition and has been documented as one of the more difficult tasks for children with language impairments (Webster & Plante, 1992).

A number of factors also contribute to these inconsistent outcomes, including the level of engagement and behavioral difficulties among these five students. One major challenge of a classroom-based intervention is engagement for a wide variety of students. More on this challenge will be discussed in the limitations section. The one child diagnosed with autism spectrum disorder in the experimental group was unable to participate for the majority of the intervention sessions due to his difficulty attending. While the sessions were highly repetitive in nature, the pace and the language used were likely a barrier to this student's learning. Most of the sessions required a 1:1 paraprofessional and moderate to maximum prompting for him to answer questions related to the material. This was also the challenge for his pre- and post-testing. These problems are not unlike the challenges found in the literature when working with young individuals with autism spectrum disorder in the general education setting (Simpson, de Boer-Ott, Smith-Myles, 2003).

Clinical Implications

Teachers and speech-language pathologists face a number of different challenges when working with children who present with various language and learning skills within the same environment. These challenges are further complicated by recent mandates such as the Common Core State Standards. A number of skills addressed in this intervention are outlined in the Common Core State Standards. While the skills are designated for Kindergarten, it is critical that students who are at risk of developing reading disorders, including those with communication disorders, are exposed to such skills as early as possible. The intervention proposed in this study offers a systematic and appropriately leveled method of instruction that may provide a valuable stepping-stone for future instruction at the preschool level. While caseloads continue to rise for school SLPs and less time is spent in the treatment room for each individual student, the need for effective classroom-based instruction is critical.

Likewise, effective classroom-based interventions are ideal for both for SLP-collaboration and Tier 1 of the RTI which states that "all students in Tier 1 receive high-quality, scientifically based instruction, differentiated to meet their needs, and are screened on a periodic basis to identify struggling learners who need additional support" (National Center for Learning Disabilities, 2011). Such instruction of PA and vocabulary at the pre-school level could aid in early identification of those students who may be at risk and. at the same time, provide structured activities that expose them to skills they are expected to have in kindergarten.

Literature over the last few decades has made researchers and educators acutely aware of the need for explicit teaching of phonological awareness skills to young students. The same is true when understanding the importance of vocabulary development for reading. While there are a number of limitations, the intervention design presented in the current study has potential to serve as a framework for future instruction due to the hybrid approach and connective material. While several students with communication disorders in this study made progress following the intervention, the changes were minimal overall. This study supports the notion that students with such difficulties need explicit instruction of phonological awareness as recommended in previous literature and that large group instruction may not be sufficient (Gillon, 2000; van Kleeck, Gillam, McFadden, 1998).

Limitations

There are several limitations to this study that may have prevented identifying more statistically significant differences. The small sample size is one overt limitation, with only 13 students in each group. A small sample for this study presents an issue of power. That is, if statistically significant differences were present, a small *n* may limit the detection thereof.

The standardized measures selected for this research, like most standardized measures, are not designed to be sensitive enough for short-term progress monitoring, as used here in this study. Better tools are needed for phonological awareness to measure gains within short periods of time with items that better correspond to the skills being taught.

With regard to the intervention, there were also several limitations. Despite the intentions and flexibility of the staff, some students had to miss the intervention due to conflicting therapy times outside the classroom. Space was also an issue for both the intervention and testing. Testing often took place in a quiet, yet distracting room (e.g., the music room) with various new items the students had never seen before. Space within the classroom also became a challenge for small group intervention. For these groups, the students met the instructor in the loft situated above the rest of classroom. While this space provided adequate distance from the other students, the clear acrylic walls allowed students to see the other activities in the classroom, which often caused distractions. Although these three limitations may have had negative effects on the testing and intervention, they are very representative of the challenges many educators face in the classroom.

Conclusions

The results of this study highlight the challenges and the opportunities educators and SLPs face in inclusive classrooms. Several decades of research and recent changes in educational policy support explicit teaching of pre-literacy skills, including phonological awareness and vocabulary, as early as possible. As suggested by these results, classroom-based instruction can be successful for some students with communication disorders, especially given the limited time students spend in the therapy room. This study also tells a cautionary tale—one that suggests that educators and SLPs carefully examine assessment materials and consider the way in which they monitor progress.

Despite the limitations of the study, the intervention proposed in this study contributes to the current literature by adding additional methods of explicit instruction for vocabulary, connective materials (i.e., consistent vocabulary in all materials), and considerations and cautions for classroom-based interventions.

Future Research

Although the design of this intervention has potential, one major element left out of this intervention was engagement. Future research will consider the framework of Universal Design for Learning (Rose & Dolan, 2000) to reach the students more effectively. There are three guidelines under this framework: 1) provide multiple means of representation, 2) provide multiple means of expression, 3) provide multiple means of engagement. Within each guideline, there are leveled principles to address accessibility, guided practice, and higher-level thinking. Using these elements of UDL, there is a great deal of potential to increase the level of engagement, representation, and expression for the current intervention. For instance, one possible way to increase engagement would to incorporate a SMART board. Such a tool would allow students to manipulate the material in a less cumbersome fashion and potentially heighten attention. A SMART board could also increase the use of different features to allow for multiples ways to represent the information including text, graphics, and film. For expression, a SMART board could allow students to draw pictures, circle the answer, or respond as they did in this intervention by pointing or verbalizing.

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